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Chronology Of KSC And KSC Related Events For 1990

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RELATED EVENTS FOR 1990 (NASA) 277 p

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National Aeronautics and
Space Administration

John F. Kennedy Space Center



**CHRONOLOGY OF KSC
AND KSC RELATED EVENTS
FOR 1990**

**BY KEN NAIL, JR.
KSC LIBRARY ARCHIVIST**

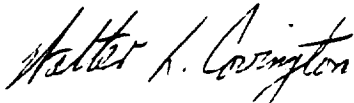
FOREWORD

This 1990 Chronology is published to fulfill the requirements of KMI 2700.1 (as revised) to describe and document KSC's role in NASA progress.

Materials for this Chronology were selected from a number of published sources. The document records KSC events of interest to historians and other researchers. Arrangement is by date of occurrence, though the source cited may be dated one or more days after the event.

Materials were researched and prepared for publication by Historian-Archivist Ken Nail, Jr., of New World Services, Inc., EG&G subcontractor for KSC Library Services. An index (p. 254) has been included for added convenience to researchers, and each entry has been headlined.

Comment on the Chronology should be directed to the John F. Kennedy Space Center, NWSI-E, Kennedy Space Center, Florida, 32899.



Walter L. Covington
Center Services

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JANUARY

January 2: COUNTDOWN STARTS JAN. 4

Countdown for the January 8 launch of Columbia begins January 4 at 7:40 a.m. and includes an extra 16 hours to allow Kennedy Space Center workers to complete prelaunch activities at pad 39A. Workers needed extra time to ensure that launch pad plumbing problems, if they occur, can be solved in time to launch as scheduled. A fuel line problem discovered in December has since been corrected. An updated Flight Readiness Review will be held by top Shuttle managers to close out any outstanding problems. [Banke, **FLORIDA TODAY**, p. 1A, Jan. 3, 1990.]

January 3: LAUNCH GO, AFTER REVIEW

A second, one-day flight readiness review pronounced Columbia ready for flight January 8, though the launch time was revised to between 8:10 and 9:04 a.m. to accommodate new information about the exact location of the Long Duration Exposure Facility (LDEF) which will be retrieved on this mission. Workers at Kennedy Space Center also filled launch pad storage tanks with propellants to be loaded aboard Columbia. The Shuttle's crew is expected to arrive at KSC on January 4. Forecast for the January 8 launch looks promising with 60 degree temperature and moderate winds of 12 mph. [Brown, **FLORIDA TODAY**, p. 6A, Jan. 4, 1990, Merzer, **THE MIAMI HERALD**, p. 1A +, Jan. 8, 1990.]

January 5: COLUMBIA'S CREW ARRIVES

"This is where people come to go fly in space and I'm real, real happy to finally be here. We're looking forward to a great flight and getting this new year off to a great start," said rookie Mission Specialist David Low on his arrival at Kennedy Space Center in preparation for Columbia's launch on January 8. Daniel Brandenstein, Commander of the Shuttle, said, "We're all ready. The pad's ready and the vehicle is just about ready, so all we've got to do is wait another day or so and we're out of here."

Brandenstein and Low arrived this afternoon with fellow crew members Pilot James Wetherbee and Mission Specialists Marsha Ivins and Bonnie Dunbar. Weather forecasts put the chances for launch January 8 at 40 percent favorable with an 80 percent chance on Tuesday. [Halvorson, **FLORIDA TODAY**, pp. 1A-2A, Jan. 6, 1990.]

UTSMAN PROMOTED TO D.C.

Thomas Utsman, Kennedy Space Center's Deputy Director since August 1985, was named today a Deputy Associate Administrator for Space Flight at NASA Headquarters in Washington, D.C. In his new post, Utsman will assist Associate Administrator for Space Flight William Lenoir in the day-to-day oversight of space programs. Since December 1986, Utsman also served as Director of Space Transportation System Management and Operations at Kennedy Space Center. ["KSC Deputy Director Boosted to D.C. Job," **FLORIDA TODAY**, p. 2A, Jan. 6, 1990.]

January 8:

WEATHER SCRUBS COLUMBIA

"We're not going to make it," Johnson Space Center Flight Director **Lee Briscoe** told Kennedy Space Center's Launch Director **Robert Sieck** just before 9:00 a.m. "Given that, we're going to have to call it a day. Nice try," Sieck told his launch team, informing them of the scrub of Columbia's launch. A nearly perfect countdown ended at the last possible minute when uncooperative weather made a Return to Launch Site (RTLS) unsafe and forced the postponement of today's launch to January 9. The crew left the Shuttle about an hour after the scrubbing and returned to rest at the Astronaut Crew Quarters. Meanwhile, pad crews drained 500,000 gallons of fuel from the external tank and prepared to reload the tank for a try the next day. [Banke and Halvorson, **FLORIDA TODAY**, pp. 1A-2A, Jan. 9, 1990, Glisch, **THE ORLANDO SENTINEL**, Jan. 7, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-4, Jan. 9, 1990, "Columbia Gets Second Shot Today," **USA TODAY**, p. 3A, Jan. 9, 1990, Merzer, **THE MIAMI HERALD**, Jan. 9, 1990, Wilford, **THE NEW YORK TIMES**, p. 24, Jan. 9, 1990.]

January 9:

COLUMBIA'S LAUNCH STARTS DECADE

"A new decade of spaceflight begins," was what Launch Commentator **Lisa Malone** said this morning at 7:35 a.m. when Columbia lifted off launch pad 39A right on schedule. NASA Administrator **Richard Truly** said, "I never saw a prettier one [launch]. I don't know how many flights we'll fly this decade, but my objective is to fly them all the way we've flown the last seven - safely." **Frederick "Rick" Hauck**, commander of the first post-Challenger flight in September 1988, was on hand at Kennedy Space Center for the launch. "It was wonderful," he said. "My knees got weak just watching it. I had good friends on board, so it was wonderful to see it happen safely." Launch Director **Bob Sieck** said, "We had advertised that the new mobile launch platform and launch pad A were operational, and we believe we proved that Tuesday. We christened it with a safe and successful launch."

"We've waited a long time for someone to go after LDEF, and we're relieved they're on their way," said **William Kinard**, NASA's chief LDEF scientist. "Our biggest relief will come when we know it's secured in the cargo bay." The retrieval of LDEF will begin at 9:44 a.m. on January 12. Astronaut **Bonnie Dunbar** will use the Shuttle's robot arm to hook and reel in the bus-sized laboratory.

At launch, there were scattered clouds at 9,500 and 30,000 feet, winds at 7 mph to the northwest and ten miles of visibility. "Looks like today's the day. Columbia, go get 'em," Sieck told both his launch team and Columbia's five-member crew. The countdown proceeded smoothly despite the presence of two technical problems which were solved during the count. A liquid hydrogen valve inside the newly modified MLP was leaking following the hydrogen tanking. A special team of workers went into the pad area and tightened the valve which stopped the leak. A circuit breaker inside the Shuttle cockpit was open when it should have been closed. Pilot **James Wetherbee** was asked to test the breaker and he did so, successfully, closing the breaker. Problems with ice forming near the top of the external tank during the countdown the previous day were solved by launch day.

All systems worked well during Columbia's 8 1/2-minute ascent into space and the Shuttle's solid rocket boosters fell into the Atlantic Ocean about 13 miles from the recovery ships. An hour later the recovery teams began preparing to tow the boosters back to Port Canaveral where they are expected to arrive early on January 10. [Higginbotham, Banke, Halvorson, Klotz and Amster, **FLORIDA TODAY**, pp. 1A-2A, Jan. 10, 1990, Wilford, **THE NEW YORK TIMES**, p. 11. Jan. 10, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-10, Jan. 10, 1990, Lebowitz, **THE ORLANDO SENTINEL**, p. A-10, Jan. 10, 1990, Hoversten, **USA TODAY**, pp. 1A-2A, Jan. 10, 1990.]

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MCCARTNEY SPEECH

"KSC is a major source of employment, revenue and tourism to the local community," **Forrest McCartney**, Space Center Director, told 75 business leaders in a speech at the Cocoa Beach Hilton today. "If KSC and the missile space business weren't here, you wouldn't see nearly the growth that we have in this area. All we have to do is keep supporting each other." McCartney also expressed confidence in Kennedy Space Center's ability to achieve this year's launch schedule of ten Shuttle flights.

"We have 10 launches scheduled this year," he said. "If we don't think we'll do it, we won't. If there's anything we're uncomfortable with, we

won't go. We aren't going to push ourselves knowingly. But I'm looking forward to a very prosperous year." ["McCartney Touts Shuttle Economics," FLORIDA TODAY, p. 10A, Jan. 10, 1990, Oates, THE ORLANDO SENTINEL, Jan. 10, 1990.]

January 10:

BOOSTERS RETURN HOME

At 7:30 this morning, Columbia's solid rocket boosters arrived at Port Canaveral. The left booster was picked up and returned by the recovery ship Freedom Star; the right SRB was retrieved and brought home by the Liberty Star. After arrival at Port Canaveral, the boosters were towed up the Banana River to Hangar AF at Cape Canaveral Air Force Station, where they were unloaded for preliminary inspections. The boosters will be disassembled and returned to Thiokol production facilities in Brigham City, Utah, for refurbishment and future Shuttle flights. [Halvorson, FLORIDA TODAY, p. 1B, Jan. 11, 1990.]

January 11:

DELTA LAUNCH DELAYED

A Delta rocket launch scheduled for January 12 has been delayed to no earlier than January 22 so workers can replace equipment in the rocket's navigation system. The Delta will carry the sixth of 21 Navstar Global Positioning System satellites. The network of satellites enables U. S. and allied military to determine their positions anywhere in the world within 50 feet and in any kind of weather conditions. [Brown, FLORIDA TODAY, p. 6A, Jan. 11, 1990.]

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MANAGEMENT CHANGES AT KSC

Kennedy Space Center Director Forrest McCartney today announced several management changes at the Center. Named as Director of Safety, Reliability and Quality Assurance is Director of Ground Engineering Alan Parrish, who succeeds Gene Thomas in the slot. Thomas was earlier named to replace Tom Utsman as Deputy Director of the Space Center when Utsman was promoted to NASA headquarters. [See January 5: Utsman Promoted to D. C.] John Lang and Jackie Smith, meanwhile, have switched jobs. Lang will become Director of Vehicle Engineering for the Shuttle Management and Operations Directorate at KSC. Smith will become Director of Safety and Reliability. ["KSC Announces Management Changes," FLORIDA TODAY, p. 6A, Jan. 11, 1990.]

January 18:

ATLANTIS PREPPED FOR MOVE

Final preparations were made today for the move of Atlantis from the Orbiter Processing Facility to the Vehicle Assembly Building where it will be mated with its solid rocket boosters and its external tank. Rollout to launch pad 39B is scheduled for January 24 with liftoff no earlier than February 16. [Halvorson, FLORIDA TODAY, p. 8A, Jan. 19, 1990.]

January 19:

BOOSTER PROBLEM DELAYS DISCOVERY

A potential problem with a solid rocket booster will delay the launch of Discovery from March 26 until at least April 19. Engineers became concerned about one of five joints inside the exhaust nozzle of Discovery's right booster which has been partially assembled at Kennedy Space Center. The joint had been checked several weeks ago at its Thiokol Corp. manufacturing site, according to Royce Mitchell, SRB Program Manager at Marshall Space Flight Center. An engineering analysis of the test data, which had been inadvertently delayed till this week, raised questions about the joint's soundness, Mitchell said. The joint cannot be further tested without disassembling the booster. Mitchell said, "In all likelihood, the joint is good, but we're going to do the safe and proper thing which is to change out the segment." A booster segment originally slated for a Columbia mission will be swapped for the suspect segment; the changeout will require at least two weeks in addition to the five to six days of travel time from the Thiokol plant in Brigham, Utah, to Kennedy Space Center. [Banke, FLORIDA TODAY, p. 4A, Jan. 20, 1990, Glisch, THE ORLANDO SENTINEL, p. A-3, Jan. 20, 1990.]

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KSC CONSTRUCTION PLANS

Approximately 450 managers attended a briefing today to learn what is on Kennedy Space Center's \$1 billion shopping list. Patrick Air Force Base and KSC contractors also outlined contracts that will be up for grabs this year. Lockheed Space Operations Co. will spend about \$20 million to upgrade a third Orbiter Processing hangar and to buy about \$1.3 million worth of computers, printers, scanners and terminals for the Shuttle data processing system. EG&G Inc. will hire firms to pave roads, repair buildings and supply equipment and services.

Other projects include: building a new space station processing facility at a cost of between \$1 million and \$1.5 million; building a new complex between launch pads 39A and 39B to house fire fighting and emergency medical equipment and personnel, costing between \$100,000 and \$500,000; repairing Saturn Causeway from the VAB to LC 39A at a cost of between

\$350,000 to \$500,000; replacing the cooling towers at the VAB Utility Annex, costing \$3 to \$5 million; installing an automated fingerprint reader system, costing between \$100,000 and \$1 million; and hiring a company to deliver liquid hydrogen at a cost of more than \$5 million. [Brown, **FLORIDA TODAY**, p. 4A, Jan. 20, 1990.]

January 20:

SHUTTLE FINALLY LANDS

Columbia finally landed this morning at 1:36 a.m. at Edwards Air Force Base (CA) ending the longest and one of the most successful rescue missions in the history of the Space Transportation System. The Orbiter had been scheduled to land January 19, but fog covered the California landing site. This morning's landing was also delayed by an hour and a half, or one Earth orbit, because a backup computer failed. The Columbia was cleared for landing after the astronauts had reassigned the backup task to one of four other computers. The extra day of flight set a record for Shuttle flight duration. NASA now plans a series of 13- and 16-day missions to help prepare the day when astronauts spend lengthy periods aboard Space Station Freedom. [Blakeslee, **THE NEW YORK TIMES**, p. 14, Jan. 21, 1990, "Fog Delays Shuttle Landing; Record Set for Longest Flight," **THE MIAMI HERALD**, Jan. 20, 1990, "Shuttle Glides To Touchdown In California," **THE MIAMI HERALD**, Jan. 21, 1990, Glisch, **THE ORLANDO SENTINEL**, p. 1A, Jan. 18, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-3, Jan. 20, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-3, Jan. 21, 1990, "Crews Ready Shuttle For Its Ride Back Home," **THE ORLANDO SENTINEL**, p. A-10, Jan. 22, 1990.]

January 22:

ROLLOUT DELAYED FOR ATLANTIS

Atlantis will rollout to pad 39A on January 24, a day later than scheduled. The delay was caused by slow work in mating Atlantis with its boosters and external tank while in the VAB. The move to the launch pad will start at 8 a.m. on the 24th. [Halvorson, **FLORIDA TODAY**, p. 4A, Jan. 23, 1990.]

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LYON TO HEAD SPACE STATION

John R. "Dick" Lyon was named Manager of the Space Station Projects Office to succeed the retiring C. M. Giesler. Lyon most recently was Deputy Director, Payload Management and Operations. Named Chief of the Project Engineering Office in the Engineering Development Directorate in 1977, Lyon became Deputy Director in 1984. In 1986 he moved to Payload Management and Operations. He joined NASA in 1964. ["John

Lyon to Head Space Station Office," **BREVARD BUSINESS NEWS**, Jan. 22, 1990.]

January 23: BOOSTER SEGMENT PROCESSED

Kennedy Space Center workers today begin processing a replacement booster segment for Discovery's STS-31 Hubble Space Telescope. Engineers ordered the segment replaced when a review of test data could not prove one of five joints inside the booster's nozzle would not leak during flight. The suspect booster segment will be returned to its manufacturer Thiokol Corp. in Utah. Electrical connections are also being tested in the Vehicle Assembly Building. [Banke, **FLORIDA TODAY**, p. 6A, Jan. 24, 1990.]

January 24: NAVSTAR LAUNCHED FROM DELTA 2

At 5:55 p.m., the Air Force launched a Delta 2 rocket carrying a Navstar Global Positioning System satellite. "Everything looks very clean, very smooth," Air Force spokesman Capt. **Ken Warren** said of the rocket which was launched from pad 17A at Cape Canaveral Air Force Station. **Ray Adams**, spokesman for Delta rocket manufacturer McDonnell Douglas Space Systems Co., said, "Great way to start a new year, a new decade." The countdown went smoothly, according to Warren, and the on-time liftoff prevented the Air Force from having to shut down the launch window for a four-minute period when the rocket could have collided with the Mir, Soviet Space Station. [Halvorson, **FLORIDA TODAY**, p. 6A, Jan. 25, 1990, "Air Force Launches Navigation Satellite," **THE ORLANDO SENTINEL**, p. A-6, Jan. 25, 1990.]

January 25: ATLANTIS ROLLS OUT

Atlantis was rolled out of the Vehicle Assembly Building this morning at 6:54 and headed for launch pad 39A. It made the 3.5 mile trip in six hours and fifteen minutes. The Shuttle was reported to be in excellent condition and ready for its February 22 launch. **Conrad Nagel**, Launch Processing Manager for the Atlantis launch, said, "The spaceship is in the best shape it's ever been in since our return to flight. If the hardware is as good to us as it has been, we should have no problem making our launch on the 22nd."

The pre-rollout preparation was conducted in record time, according to Nagel: The Shuttle spent 69 days in the Orbiter Processing Facility, 10 days fewer than any of its post-Challenger missions; in six days, Atlantis

was mated to its solid rocket boosters and external tank in the VAB, two days faster than normal.

Meanwhile, Columbia flew from Edwards Air Force Base (CA) atop its 747 carrier plane and landed for refueling in Arizona at Davis-Monthan Air Force Base (Tucson, AZ) about 2 1/2 hours later; after refueling, the pair left Arizona and headed to Kelly Air Force Base in Texas for its overnight stop and a return to Kennedy Space Center on January 26, at about 2 p.m. [Halvorson, **FLORIDA TODAY**, p. 1A, Jan. 26, 1990.]

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MEMORIAL CONSTRUCTION TO BEGIN

Ben Everidge, President of the Astronauts Memorial Foundation, announced today that construction of a 42-foot polished granite memorial will begin February 1 at a cost of \$4.15 million. Construction was to have been started this month but the AMF rejected bids considered too high. [Brown, **FLORIDA TODAY**, p. 7A, Jan. 25, 1990.]

January 26:

COLUMBIA RETURNS HOME

"I think the [LDEF] looks terrific," said **Carol Kaiser**, chief engineer of the LDEF project, after Columbia and its cargo returned to Kennedy Space Center at 3:30 p.m. today. "Some of the panels on the end of LDEF had some obvious changes," added **Larry Brumfield**, the man in charge of bringing both Columbia and LDEF back to KSC. "But we expected some deterioration because of the 5 1/2 years in orbit. And changes in materials are especially interesting to us." NASA spokeswoman **Pat Phillips** characterized the ferry flight as "very smooth." The Orbiter atop its 747 carrier plane left Texas at 9:55 a.m. this morning; refueled at Eglin Air Force Base in Fort Walton Beach (FL) before landing at Kennedy Space Center in mid-afternoon. [Halvorson, **FLORIDA TODAY**, p. 5A, Jan. 27, 1990.]

January 28:

CHALLENGER REMEMBRANCE

Kennedy Space Center's flags flew at half-staff today in memory of the Challenger crew who died four years ago. Because most KSC employees do not work on the weekend there were no formal ceremonies planned to honor the astronauts, so Center Director **Forrest McCartney** spoke on closed circuit television to employees on Friday (January 26).

Meanwhile, at the space center, workers prepared to remove the Long Duration Exposure Facility from Columbia's payload bay and prepared Atlantis for the upcoming prelaunch countdown dress rehearsal. Launch

of Atlantis on its Department of Defense mission continues to be set for not earlier than February 22. [Halvorson, **FLORIDA TODAY**, p. 1B, Jan. 27, 1990, "KSC Flags Will Fly at Half-Staff In Honor of Challenger Crew," **FLORIDA TODAY**, p. 10A, Jan. 28, 1990, Minor, **THE ORLANDO SENTINEL**, p. F-2, Jan. 25, 1990.]



ATLANTIS TEST COMPLETED

Workers at Kennedy Space Center successfully completed a routine test of Atlantis' main engines today and thereby cleared the way for next month's Department of Defense mission. At the end of the test, Atlantis was powered down. In the Orbiter Processing Facility, technicians prepared to open Columbia's payload bay tomorrow to begin the inspections of the recently returned Long Duration Exposure Facility (LDEF). ["KSC Finished Routine test of Atlantis," **FLORIDA TODAY**, p. 4A, Jan. 29, 1990.]

January 29:

ORBITER UPDATE

Atlantis: The crew for Atlantis' Department of Defense mission arrive this week at Kennedy Space Center for a practice countdown at pad 39A. Commander John Creighton, Pilot John Casper and Mission Specialists David Hilmers, Richard Mullane and Pierre Thuot will also take part in emergency drills at the launch pad.

Discovery: Technicians in the Orbiter Processing Facility this week will test the Orbiter's water spray boilers, waste containment system and potable water system and check the connections between the Orbiter and its payload. In the Vehicle Assembly Building, technicians are preparing the solid rocket boosters and an external tank for Discovery's next mission.

Columbia: The Long Duration Exposure Facility will be unloaded from the Orbiter's cargo bay this week and taken to a spacecraft assembly building for thorough checkout. ["Orbiter Update," **FLORIDA TODAY**, p. 8E, Jan. 29, 1990, Halvorson, **FLORIDA TODAY**, p. 4A, Jan. 30, 1990.]



NINE FLIGHTS IN 90

NASA said today that recent delays in launching Columbia has caused the reduction in flights planned for 1990 from ten to nine, the number the space agency says it can fly safely. "There have been eight highly successful Space Shuttle missions in 15 months since our return to flight in September 1988," said NASA Administrator Richard Truly, expressing optimism about the new schedule. A Strategic Defense Initiative mission has been rescheduled from November 1, 1990, until January 1992.

Additionally, a Gamma Ray Observatory, originally planned to launch aboard Atlantis June 4, 1990, has been delayed until November 1, 1990. [Halvorson, **FLORIDA TODAY**, p. 1A, Jan. 30, 1990, "NASA Shuffles Shuttle Schedule," **THE MIAMI HERALD**, Jan. 30, 1990.]

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ATLANTIS GETS PROPELLANTS

A skeleton crew at launch pad 39A began loading toxic propellants into Atlantis' on-board storage tanks for use by the Orbiters steering jets. **Lisa Malone**, Kennedy Space Center spokeswoman, said propellants will also be loaded into the Shuttle's auxiliary power units and hydraulic power units on Atlantis' solid rocket boosters. The loading operations will continue through January 31. Liftoff remains set for February 22. [Halvorson, **FLORIDA TODAY**, p. 4A, Jan. 30, 1990.]

January 30:

LDEF LIFTED FROM COLUMBIA

"It looks like something that has weathered a bit," said Chief Scientist **William Kinard** of the Long Duration Exposure Facility (LDEF) today as it was lifted from Columbia's cargo bay early this morning. "It's faded. Some of the things that were bright colors are not bright colors anymore. Some areas that were painted are now bare metal. Some of the composite materials and epoxy materials lost their luster, and there are stains on it. It's going to be a handbook on how to build a spacecraft," he added.

Initial plans call for a thorough inspection and extensive photo survey before experimenters and four special teams get close to the spacecraft, said **Carol Kaiser**, LDEF Chief Engineer. Research will be conducted in four areas:

- *Documenting all meteorite and space debris hits. LDEF scientists expect they will find as many as 10,000.

- *Measuring the amount of radiation emanating from the facility.

- *Examining materials used in the construction of LDEF, such as its thermal blankets and its aluminum structure.

- *Inspecting spacecraft electronics and data systems as well as batteries and mechanical systems.

One of the first experiments to be removed from LDEF will be the Space Exposed Experiment Developed for Students, according to Kaiser. "We'll take off the SEEDS experiment early on so the Park Seed Co. can do its

processing to get the packages out to the students before the end of the school year," she said. As for LDEF itself - the main frame of the spacecraft minus the experiments - Kinard said, "What we'd like to do is fly it again. The structure is in great shape. All we'd really need to do is bolt on another set of experiments and the facility would be ready to go." [Glisch, **THE ORLANDO SENTINEL**, p. A-7, Jan. 31, 1990, Halvorson, **FLORIDA TODAY**, pp. 1A-2A, Jan. 31, 1990.]

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SHUTTLE FLIGHT SCHEDULE

NASA said today that delays in launching Columbia will cause one Shuttle flight to be dropped from the 1990 flight schedule and another to be postponed. A Strategic Defense Initiative mission has been bumped from November 1 to January 1991. A Gamma Ray Observatory, originally set for launch aboard Atlantis on June 4, has been delayed five months until Nov. 1. [Halvorson, **FLORIDA TODAY**, p. A1, Jan. 30, 1990.]

January 31:

COLUMBIA FLEW FLAWED SEAL

Columbia was launched with a flawed solid rocket booster seal. Space Shuttle Program officials at Kennedy Space Center said the flaw went undetected during production and at shipment from manufacturer Thiokol Inc.'s plant in Utah to the space center. "You would be hard pressed to see it [the blemish] with the naked eye," said Processing Director Conrad Nagel. "But Thiokol probably should have caught the problem." He said the space agency expects manufacturers to "do everything they need to do to leave no doubt that when the hardware comes to Kennedy it's ready to fly. We're looking for good hardware, and we've got to trust that when manufacturers send a seal down here it's had the proper inspections."

R. E. Lindstrom, Thiokol's senior vice president of space operations, said the defect was too small to have been identified using testing procedures at the time. "This type of internal defect is only apparent after extended use and while the gasket is compressed. The defect we identified after flight was on a gasket that had not received the extended compression test."

NASA also determined that tests on a spare high-pressure fuel turbopump revealed defective welds that could cause the pumps to fail during flight. The problem has forced the space agency to replace a pump on the No. 3 engine aboard Atlantis, now being prepared on Pad 39A for a Feb. 22 launch. **Norman Parmet**, vice chairman of NASA's Aerospace Safety Advisory Panel said, "They'd better look at their quality assurance procedures. You've got a million darn inspections on these things and

you've got to do every damn one of them." [Glisch, **THE ORLANDO SENTINEL**, p. A-4, Feb. 1, 1990, Halvorson and Higginbotham, **FLORIDA TODAY**, pp. 1A-2A, Feb. 1, 1990.]

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ATLANTIS BOOSTER TESTS COMPLETE

Kennedy Space Center workers today completed testing the hydraulic power units in Atlantis' solid rocket boosters and finished loading fuel at launch pad 39A. Technicians spent the day removing heat shields and panels from around the NO. 3 main engine, which will have its turbopump changed out during the weekend. Tests on another pump at manufacturer Rocketdyne revealed minute imperfections, and X-rays are being analyzed to determine if this pump is damaged. Atlantis' crew arrives at Kennedy Space Center February 1 to take part in a practice countdown February 2-3 before the scheduled February 22 launch. ["Space Briefs: Atlantis Rocket Booster Power Tests Complete," **FLORIDA TODAY**, p. 10A, Feb. 1, 1990.]

FEBRUARY

February 1: ATLANTIS CREW ARRIVES

Atlantis' five-member crew arrived at Kennedy Space Center today in an enthusiastic but not talkative mood. The Commander **John Creighton** hollered, "You bet," when he was asked if the crew were ready for flight on February 22. He and the remainder of his crew - Pilot **John Casper** and Mission Specialists **David Hilmers**, **Richard Mullane** and **Pierre Thuot** - gave "thumbs-up" signals when their T-38 training jets touched down on the space center's Shuttle Landing Facility. The crew will participate in a practice countdown today and tomorrow and will enter the crew cabin for the final three hours of the simulation tomorrow.

Today, workers will position Atlantis' engines, place scaffolding and prepare a device that will be used to hoist the turbopump. The procedure will be completed next Thursday (February 8), when a new turbopump and heat shields are in place, according to KSC spokeswoman **Lisa Malone**. [Higginbotham, **FLORIDA TODAY**, p. 4A, Feb. 2, 1990.]

February 2: SPACEPORT USA ATTENDANCE

Attendance at Kennedy Space Center's Spaceport USA increased 6.9 percent in January from a year earlier. The number of visitors rose from 192,264 to 205,600. ["Across the State," **THE ORLANDO SENTINEL**, Feb. 3, 1990.]

February 3: ORBITER UPDATE

Atlantis: Workers this weekend continued changing the high-pressure fuel turbopump on engine No. 3 after X-rays revealed defective welds on an inner component. No paperwork could be found to show whether the problems had ever been fixed. The pump will undergo testing this week simultaneous with other planned work.

Discovery: Technicians tested the remote manipulator system, installed heat shields around the main engines and prepared to test connections between the Orbiter and its payload, the Hubble Space Telescope.

Columbia: Workers repositioned the Shuttle's elevons and body flap to remove the No. 2 main engine so it can be fitted with a turbopump from Atlantis for Columbia's next missions. Technicians also performed routine post-flight tests on the Orbiter's systems. **Endeavour:** At Rockwell International's Orbiter assembly plant (Palmdale, CA), technicians have

moved the Shuttle's aft compartment into place at the rear of the Orbiter. ["Orbiter Update," **FLORIDA TODAY**, p. 8E, Feb.4, 1990.]

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PRACTICE COUNTDOWN COMPLETED

The practice countdown for Atlantis' February 22 launch ended today at 11 a.m. with the countdown clock reading five seconds prior to liftoff. The five-member crew spent the final two hours of the countdown inside the Orbiter going through the routine they would use during an actual mission. The crew includes Commander **John Creighton**, Pilot **John Casper** and Mission Specialists **David Hilmers**, **Richard "Mike" Mullane** and **Pierre Thuot**; they left Kennedy Space Center about two o'clock today, returning to Houston in their T-38 training jets.

Workers will replace a seal on one of Atlantis' solid rocket boosters tomorrow because a flawed one was found on Columbia after its January mission. Spokesmen said that the eight-hour change-out procedure should not delay the flight. Work also continues on the replacement of a turbopump. ["Astronauts Pass Countdown Test," **THE ORLANDO SENTINEL**, p. A-4, Feb. 4, 1990, Higginbotham, **FLORIDA TODAY**, p. 7A, Feb. 4, 1990.]

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KSC CONSTRUCTION BUDGET

Construction projects at Kennedy Space Center amount to some \$47 million in **President Bush's** fiscal 1991 budget request. The \$47.2 million request included \$25 million for construction of a Space Station processing facility at the space center. The budget also calls for a civil service increase of 116 persons, from 2,433 to 2,549. The budget request also includes \$5.5 million for construction of a Transporter/Canister Facility, \$9.5 million for construction of a Processing Control Center; \$2.1 million for environmental upgrades in the Hypergolic Maintenance Facility; \$1 million to replace a cooling tower at the Operations and Checkout Building; \$900,000 for restorations in the Heavy Equipment Area and \$3.3 million to upgrade heating and air conditioning in the Orbiter Processing Facility. [Halvorson, **FLORIDA TODAY**, p. 7A, Feb. 4, 1990.]

February 5:

ATLANTIS TURBOPUMP INSPECTED

A main engine turbopump was removed today from Atlantis to determine whether an internal weld was repaired properly. Depending on the outcome of the tests (which use X-Rays and special dyes) and schedule demands, NASA will either replace the pump or use a refurbished pump from Columbia's last mission. "We don't expect it to change the [launch]

date, but we'll be hard pressed to get the aft compartment closed out on time," said spokeswoman Lisa Malone. A Flight Readiness Review scheduled for February 9-10, will assess launch preparations and set a firm launch date. [Brown, **FLORIDA TODAY**, p. 2A, Feb. 6, 1990.]

February 6: GAMMA RAY OBSERVATORY ARRIVES

The Gamma Ray Observatory arrived at Kennedy Space Center today at 7:15 a.m.; it was transported aboard an Air Force C-5A cargo plane. One of four "great observatories" to be launched by NASA, the Gamma Ray Observatory will study the structure of stars, galaxies and the cosmos from Earth orbit.

"It's a major milestone," said Stan Rieb, Project Manager with the 17 1/2-ton spacecraft's manufacturer, TRW Inc. "This really is the culmination of about seven years of effort on our part." He said the spacecraft is equipped with four instruments which will study gamma ray emissions in space, including those from the "big bang," the primeval explosion which scientists think created the universe about 15 billion years ago. ["Observatory Arrives at KSC for Later Launch," **THE ORLANDO SENTINEL**, p. A-9, Feb. 7, 1990, Halvorson, **FLORIDA TODAY**, p. 6A, Feb. 7, 1990.]

□ ATLANTIS LAUNCH PREPARATIONS

Today technicians at Launch Pad 39A continued preparations to remove and replace a suspect fuel turbopump from the No. 3 main engine of Atlantis. The change-out will occur later this week and will take two days. Kennedy Space Center managers today will meet to determine whether Atlantis and its classified cargo will be ready for its February 22 launch date. The firm launch date will be announced upon the conclusion of the two-day Flight Readiness Review which concludes February 10. [Halvorson, **FLORIDA TODAY**, p. 6A, Feb. 7, 1990.]

□ EDUCATION CENTER FOR KSC

NASA has given permission for the Astronauts Memorial Foundation to build an education center at Kennedy Space Center, according to AMF officials today. The center will be constructed on approximately 6 acres near Spaceport USA and will house a resource center for use by children from kindergarten-age through high school. Costing about \$14 million which includes a trust for continuous operations, the center would be paid for through money raised by Challenger license plate sales and corporate

donations. ["AMF: NASA OKs Education Center," FLORIDA TODAY, p. 6A, Feb. 7, 1990.]

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BUDGET: POTENTIAL CONSTRUCTION

If Congress approves President Bush's request for \$47.2 million for construction, Kennedy Space Center will experience a construction boom. The building program would include a building for readying pieces of the Space Station Freedom for launch. Other construction in the President's budget proposal includes: \$14 million for two new buildings to help Shuttles for flight and \$5 million to improve existing Shuttle facilities. [Glisch, THE ORLANDO SENTINEL, p. A-9, Feb. 7, 1990.]

February 8:

ATLANTIS PAD ACTIVITIES

At Launch Pad 39A, workers rolled back the Rotating Service Structure from around Atlantis just after noon today, but NASA officials would not say why. Spokeswoman Lisa Malone said, "We've got activities planned at the launch pad that require the move. There is nothing wrong with the vehicle." The structure is usually rolled back the day before the payload arrives at the pad.

Meanwhile, Program Managers meeting at Kennedy Space Center in a Flight Readiness Review are considering moving up Discovery's launch date. Preparation of a solid rocket booster segment needed for Discovery is about one week ahead of schedule. "We're taking a look to see if we can pull back the launch date and re-target to April 12," Malone said, though the official launch date remains set at April 18. Discovery's mission will include the deployment of the Hubble Space Telescope. According to spokesman George Diller, KSC workers have been told to be ready for an April 12 launch. [Banke, FLORIDA TODAY, p. 4A, Feb. 9, 1990, Banke, FLORIDA TODAY, p. 5A, Feb. 10, 1990.]

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CLASSIFIED DELTA LAUNCH

A Strategic Defense Initiative mission delayed by an accident on the launch pad will lift off aboard a Delta rocket from Cape Canaveral Air Force Station next week. During launch preparations, a technician dropped a small tool in an area near two satellites; the 4-inch-long tool became lodged about four feet below an access door on the nose cone of the Delta rocket. Workers had to remove part of the nose cone to reach the tool and then had to perform additional tests to assure that the satellites were undamaged. ["Delta Will Loft 2 Satellites," FLORIDA TODAY, p. 4A, Feb. 9, 1990.]

□

NEW LAB DEDICATED

A new facility which will improve satellite rocket motor inspections was dedicated today. The laboratory, which cost \$4.9 million, replaces a facility which was too small and which had obsolete equipment, said Jim Towles, Kennedy Space Center's Director of Facilities Engineering. The new facility will house an upgraded X-ray machine which will be used to make sure motors don't have cracks. An INTELSAT communications satellite will be the first to undergo inspections in the new building. ["New \$4.9 Million Lab Will X-Ray Rocket Motors," **FLORIDA TODAY**, p. 4A, Feb. 9, 1990.]

February 10:

ATLANTIS LAUNCH SET

Liftoff for Atlantis's classified Department of Defense mission will occur February 22 between midnight and 4 a.m., according to Kennedy Space Center spokeswoman **Lisa Malone**. The announcement came at the conclusion of the two-day Flight Readiness Review today at the space center. The mission is expected to be the first in which a new northerly flight path is taken by a Shuttle. The all-military crew for the mission includes Commander **John Creighton**, Pilot **John Casper** and Mission Specialists **Richard Mullane**, **David Hilmers** and **Pierre Thuot**. Crew members making their first spaceflights are John Casper and Pierre Thuot. [Halvorson, **FLORIDA TODAY**, p. 1A, Feb. 11, 1990.]

February 12:

ATLANTIS TESTED

Workers at Kennedy Space Center today will continue testing and inspections necessary before Atlantis lifts off next week on a mission for the Department of Defense. The Shuttle's main engines will be calibrated during a simulated main engine start, and then leak tests will be performed on a main engine turbopump that was replaced over the weekend, according to KSC spokeswoman **Lisa Malone**. She said all weekend tasks went smoothly and Atlantis is expected to launch Feb. 22. ["Tests on Atlantis Going Smoothly," **FLORIDA TODAY**, p. 2A, Feb. 12, 1990.]

February 13:

HELIUM LEAK TEST TODAY

Today workers at Launch Pad 39B will test Atlantis' three main engines by pumping gaseous helium through the main propulsion system and then checking for its presence in unwanted areas, indicating leaks. This standard pre-launch check follows a routine engine test conducted yesterday on the Shuttle's hydraulic system.

Columbia's payload bay floor gets a cleaning this week. The floor was covered with material that fell off the Long Duration Exposure Facility during its return to Earth, according to NASA spokesman **Bruce Buckingham**. [Banke, **FLORIDA TODAY**, p. 4A, February 13, 1990.]

□

LDEF DATA ANTICIPATED

When NASA photographers complete their picture-taking of the recently returned Long Duration Exposure Facility (LDEF), scientists are prepared to undertake their own investigations of the effect of long duration spaceflight on the spacecraft. "Clearly the space environment is a very harsh environment," said **Ann Whitaker**, an LDEF scientist from Marshall Space Flight Center (Huntsville, AL). She said that some materials eroded in space and others experienced substantial color changes from exposure to thin traces of atomic oxygen; some white and yellow paints turned brown. LDEF scientist **Donald Wilkes** said that most of the changes were expected, but he cautioned against premature judgments. "We really have to wait until we get the experiments into the laboratory and make a detailed analysis before we can understand these processes. [Banke, **FLORIDA TODAY**, p. 6A, Feb. 14, 1990.]

February 14:

DELTA 2 LAUNCH

A Delta 2 rocket, built by McDonnell Douglas Space Systems Co., lifted off from Cape Canaveral Air Force Station this morning at 11:15 a.m. The launch, which sent two satellites into orbit, represented the first time that the Department of Defense purchased a rocket and launch services from a private company instead of NASA. McDonnell Douglas will earn \$38 million from the launch and DOD estimates it will save between \$13 and \$17 million by buying commercial services.

"We're off to a very good start," said Lt Col. **Roger Hartman** of the Strategic Defense Initiative Organization. "It was really an exceptional launch. The actual liftoff was within 600 milliseconds of the scheduled launch time and the satellites' orbits are right on the money." [Halvorson, **FLORIDA TODAY**, p. 10A, Feb. 15, 1990.]

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ATLANTIS: ALL SYSTEMS GO

"There are no problems to report. We're just another day closer to launch," said Kennedy Space Center spokesman **Bruce Buckingham** of the preparations for Atlantis' February 22 launch. Today's helium leak check test revealed no trouble for the main propulsion system, according to Buckingham. Last-minute inspections and installations of thermal blankets

still remain to be accomplished. The five-member crew is expected to arrive at KSC on February 18. [Banke, **FLORIDA TODAY**, p. 6A, Feb. 14, 1990, Banke, **FLORIDA TODAY**, p. 11A, Feb. 15, 1990.]

□

SECOND TITAN READIED

Martin Marietta workers moved the company's second Commercial Titan rocket to Launch Complex 40 at Cape Canaveral Air Force Station today. The launch vehicle is expected to boost an INTELSAT 6 communications satellite into orbit March 14. INTELSAT 6 is owned and operated by an international consortium which includes the United States. The satellite is undergoing final inspections at Astrotech Space Operations' satellite processing facility (Titusville, FL) and is expected to arrive at the launch pad this weekend. ["Martin Readies Second Titan," **FLORIDA TODAY**, p. 11A, Feb. 15, 1990.]

February 16:

SPACEPORT WORKERS UNION VOTE

International Association of Machinists and Aerospace Workers this morning will vote on whether to accept their Spaceport USA employer's new contract offer; the union leadership advises against it. "We are hopeful the employees will accept the package offered to them. We will be open today with business as usual no matter what their decision may be," said Tom Blair, spokesman for TW Recreational Services, which operates the Kennedy Space Center tourist attraction. [Oates, **THE ORLANDO SENTINEL**, pp. C-1 & C-6, Feb. 13, 1990, Oates, **THE ORLANDO SENTINEL**, Feb. 14, 1990, "Across the State," **THE ORLANDO SENTINEL**, Feb. 15, 1990, "Spaceport Workers To Vote on Contract," **FLORIDA TODAY**, p. 1B, Feb. 16, 1990.]

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EG&G WORKERS TO VOTE

About one hundred workers for EG&G Florida Inc. who are employed at Kennedy Space Center will vote tomorrow on a new labor contract approved by their union leadership. Terms of the agreement will not be announced till after the vote, according to Union Business Manager Andy Younger.

The International Alliance of Theatrical and Stage Employees (IATSE) represents 105 graphic artists, writers, projectionists, clerks, printers and electronic data experts employed by EG&G Florida Inc. ["EG&G Workers Will Vote On Pact," **FLORIDA TODAY**, p. 16C, Feb. 16, 1990, "EG&G Florida Inc," **THE ORLANDO SENTINEL**, February 15, 1990.]

□

IATSE APPROVED UNANIMOUSLY

International Alliance of Theatrical and Stage Employees (IATSE) Business Manager **Andy Younger**, invoking union policy, would not reveal the contract vote his union took yesterday concerning its contract with EG&G FLORIDA Inc. He did, however, say that it might be characterized as "unanimous." [Telephone conversation with Andy Younger (IATSE) and Archivist Ken Nail, Jr., March 19, 1990.]

□

STRIKE POSSIBLE AT SPACEPORT

Spaceport USA workers rejected a contract offer yesterday and opened the possibility of a strike. "We haven't called a strike. But if we do, we'll make sure it will be to our benefit," said **Wann Cairns**, a Spaceport USA bus mechanic and president of the International Association of Machinists and Aerospace Workers, District 166. "We'd be happy to sit down at the table with them to get to a point that's reasonable." Marketing Director **George Meguiar** said, "We will be open for business as usual," adding that TW Recreational Services which operates the attraction has a contingency plan if the union decides to strike. If that happened, bus tours might be affected. **Arnold Richman**, NASA spokesman, said that the space agency would not allow unqualified drivers to replace striking bus operators. The union will vote on a new contract which is endorsed by union negotiators on February 20. [Brown, **FLORIDA TODAY**, p. 1A, Feb. 17, 1990, Halvorson, **FLORIDA TODAY**, p. 1A, Feb. 18, 1990, Oates, **THE ORLANDO SENTINEL**, Feb. 17, 1990.]

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ORDNANCE PLACED ON ATLANTIS

Workers continued to prepare Atlantis for its February 22 liftoff by installing ordnances on the Shuttle, pressurizing on-board rocket propellant tanks and loading liquid oxygen and hydrogen storage tanks on the Shuttle's service tower. Before the pad was closed late today, technicians repaired some torn and missing insulation on the outside of the exhaust nozzles on the three main engines, said NASA spokesman **Bruce Buckingham**. [Banke, **FLORIDA TODAY**, p. 2A, February 17, 1990.]

□

GAMMA RAY OBSERVATORY REPAIRS

Inspections have shown that the Gamma Ray Observatory received minor damage on its trip to Kennedy Space Center, according to KSC spokesman **George Diller**. The observatory's insulation was stained in eight places; seven of the eight will be removed with alcohol and the eighth repaired by replacing one square foot of insulation. Six of the 25,600 solar cells were

cracked during preparations for shipping and more study of this problem will be undertaken.

In another payload facility, technicians performed the last tests on the science instruments aboard the Hubble Space Telescope this morning and all instruments worked as expected. Work now turns to final pre-launch operations, including removing non-flight items aboard the telescope, installing flight batteries and giving the telescope a final cleaning before it is launched aboard Discovery April 12. [Banke, **FLORIDA TODAY**, p. 2A, Feb. 17, 1990.]

February 18:

RUSSIANS ARE COMING

Kennedy Space Center welcomes two diverse groups today. An all-military crew of astronauts, scheduled to fly STS-36 on February 22, will arrive at 10:30 a.m. today, as will a contingent of some two dozen Soviet officials, including ten members of the Defense Committee of the Soviet National Legislature. Along with other Soviet officials, the visiting defense committee members will tour the Operations and Checkout Building and Launch Pad 39B. [Halvorson, **FLORIDA TODAY**, p. 1A, Feb. 18, 1990.]

□

LAUNCH PREPARATIONS CONTINUE

While Soviet defense committee members tour Launch Pad 39A, technicians at Launch Pad 39B prepare the launch site for Atlantis and its classified cargo "which is thought to be an advanced spy satellite that will photograph Soviet military installations." Dick Young, NASA spokesman, said efforts would be focused on completing work in the Shuttle's rear compartment where the three main engines are located. Countdown for the STS-36 mission will begin at 4 p.m. February 18. [Halvorson, **FLORIDA TODAY**, p. 2A, Feb. 18, 1990.]

February 19:

ATLANTIS COUNTDOWN PROCEEDS

"So far, so good," said Kennedy Space Center spokesman Karl Kristofferson. "The countdown is going very smooth." Atlantis is scheduled for a liftoff sometime between midnight and 4 a.m. February 22. The exact liftoff time is classified as is the cargo which is known to weigh 37,300 pounds. At Launch Pad 39A today, technicians activated the Shuttle's navigation system and stowed equipment the astronauts will use in the Orbiter's crew compartment. Workers also completed final checks of the Shuttle's main propulsion system and began loading propellants. The crew for the mission: Commander John Creighton, Pilot John Casper

and Mission Specialists David Hilmers, Richard "Mike" Mullane and Pierre Thuot. [Halvorson, **FLORIDA TODAY**, p. 5A, Feb. 20, 1990.]

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PRINCE CHARLES AT KSC

Prince Charles, heir to the British throne, was given an insider's look at the U. S. space program today as Kennedy Space Center Director **Forrest McCartney** escorted the prince through the center's wildlife refuge, a firing room in the Launch Control Center and a hangar where Space Shuttles *Columbia* and *Discovery* are being refurbished. Charles conversed with KSC workers in the places he visited. **Roberta Wyrick** (Cocoa, FL) said, "He wanted to know what the consoles are up there, what the different systems are and how we get through a normal launch."

Charles was accompanied by several friends, including **King Constantine of Greece**, and by astronaut **Michael McCulley**. The prince spent about an hour in the wildlife refuge, filming segments for a 60-minute British environmental documentary which will be televised in May. McCartney said, "We've got one of the premiere wildlife refuges in the United States. As luck would have it, there was a big alligator swimming in the lagoon when we got there." McCartney gave Prince Charles a book on eagles - one of the 280 bird species on Kennedy Space Center. The center director, in turn, was given a copy of the prince's book: "A Vision of Britain." [Higginbotham, **FLORIDA TODAY**, p. 1A, Feb. 20, 1990.]

February 20: WEATHER MAY AFFECT LIFTOFF DATE

"We're looking at a 30 percent chance the weather will be favorable for launch," said **Lisa Malone**, NASA spokeswoman. The problem is an approaching cold front now over South Florida, said Air Force spokeswoman **Terri Bracher**. "Apparently, the front slowed down and isn't going to move through the area as fast as expected," she said. Weather later in the week is expected to be more cooperative. ["Bad Weather Could Delay Shuttle Launch," **THE MIAMI HERALD**, Feb. 21, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-6, Feb. 21, 1990, Halvorson, **FLORIDA TODAY**, p. 1A, Feb. 21, 1990.]

□

STRIKE THREAT AVERTED

A new three-year contract was approved today by the International Association of Machinists and Aerospace Workers, District 166, averting a possible strike at Kennedy Space Center's Spaceport USA. The contract with TW Recreational Services, operator of the attraction, preserves the company's previously offered raises, but shifts the cost of health insurance

for workers and their families to the company if the employee works a minimum of 1,000 hours a year (about 17 hours a week). [Brown, **FLORIDA TODAY**, p. 1A, Feb.21, 1990, Oates, **THE ORLANDO SENTINEL**, p. B-2, Feb. 21, 1990.]

February 21: **SORE THROAT CHOKES LAUNCH**

John Creighton, Commander of STS-36, developed an upper respiratory tract infection in the 24 hours prior to liftoff, NASA officials said. He is being treated with antibiotics. "It's basically a sore throat with a little head congestion," said NASA spokesman **Kyle Herring**. Creighton's illness has grounded Atlantis for at least 24 hours and meteorologists said today that weather could postpone the mission even longer. A poor forecast was a factor in today's postponement, but the countdown would have continued in the hopes of clear skies if not for Creighton's illness.

The postponement marked the first time NASA ever delayed a manned mission because of an astronaut's health. The last time an astronaut's health affected a mission was in April 1970, when Apollo 13 command module pilot **Thomas Mattingly** was replaced five days prior to launch because he had been exposed to measles. Mattingly was replaced by **James Swigert** and the launch went on as planned. NASA said there are no plans to remove Creighton from the mission.

Replacing Creighton could be done, but it would create difficulties because NASA has discontinued the practice of training back-up crew members after the fourth Shuttle flight in 1982. "As the Shuttle flight rate goes up, you are obviously going to have a number of astronauts who are capable - if it's critical - to take that role," Herring said. [Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-4, Feb. 22, 1990, Halvorson, **FLORIDA TODAY**, pp. 1A-2A, Feb. 22, 1990, Leary, **THE NEW YORK TIMES**, Feb. 22, 1990, "Launch of Atlantis is Off Till Saturday," **THE MIAMI HERALD**, Feb. 23, 1990.]

□ **HUBBLE MISSION ADVANCED**

NASA said today it was advancing the launch date for the Hubble Space Telescope mission aboard Discovery to April 12. Work on a new booster segment was completed earlier than scheduled, prompting the space agency to move up the launch date. "A lot of dedicated NASA and contractor employees were faced with a big challenge early this year and not only did they meet the challenge, they surpassed it," said Shuttle Program Director **Robert Crippen**. Launch time on April 12 will be

between 9:21 a.m. and 1:21 p.m. [Halvorson, FLORIDA TODAY, p. 4A, Feb. 22, 1990.]

February 23: ATLANTIS LAUNCH DELAYED

Threatening weather forced NASA to postpone launch of Atlantis a third time this morning; launch is tentatively rescheduled for February 25. Launch had been postponed on the 21st and 22d due to Commander John Creighton's sore throat and head congestion and due to unacceptable weather in the Kennedy Space Center vicinity. Despite the weather and illness, Commander Creighton continued to make flights in the Shuttle Training Aircraft. According to NASA, each day's delay costs \$247,000 in labor and materials at the space center. That figure does not include expenses at other NASA centers supporting the mission. [Halvorson, FLORIDA TODAY, p. 1A, Feb. 24, 1990.]

□ TOMATO SEEDS UNLOADED

"Its been a long time coming, like a six-year pregnancy," said Jim Alston, Research Director for the Park Seed Co. (Greenwood, SC), sponsor of NASA's Space Exposed Experiment Developed for Students. The SEEDS experiment is one of 57 which flew aboard the recently returned Long Duration Exposure Facility (LDEF). Today workers removed some 12 million tomato seeds from the 22,000-pound satellite in preparation for their being sent to students across the United States. Alston said, "The primary feature of this experiment is to get kids excited about and interested in science. If we can get 100 or 1,000 students to enter the scientific community, then that will be the long-term benefit of the experiment." [Halvorson, FLORIDA TODAY, Feb. 22, 1990, Halvorson, FLORIDA TODAY, p. 4A, Feb. 24, 1990.]

February 24: TELEDYNE WINS SPACELAB CONTRACT

Teledyne Brown Engineering has been selected by NASA to handle engineering work related to Spacelab missions on the Shuttle. Under the 10-year contract beginning October 1, Teledyne Brown will staff, manage and buy materials needed to integrate Spacelab missions and mid-deck experiments aboard the Shuttle. The next two Spacelab experiments will fly in May and August of this year. ["Teledyne Wins Spacelab Contract," FLORIDA TODAY, p. 8E, Feb. 25, 1990.]

February 26:

LAUNCH READIED

With Atlantis' computer and engine problems solved, technicians at Kennedy Space Center readied the Orbiter for another launch try today. Forecasters said there was a 60 percent chance that high winds off the ocean could halt the launch, but space experts noted that other Shuttle missions had begun in the face of similar predictions. Weather conditions had been almost ideal on the 25th when the countdown had been halted at 11 seconds when a backup Air Force range-safety computer on the ground malfunctioned because of a software problem. Lieut. Col. Jim Jannette (Air Force) said both the computer and its backup must be running in most cases before a launch is approved. When the countdown was halted, other problems developed. For instance, the auxiliary power units began to run out of fuel. [Glisch, **THE ORLANDO SENTINEL**, p. A-10, Feb. 25, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-4, Feb. 26, 1990, Leary, **THE NEW YORK TIMES**, p. A12, Feb. 26, 1990.]

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WEATHER SCRUBS ATLANTIS AGAIN

High winds and clouds scrubbed Atlantis for the fifth time today causing a delay till February 28 at the earliest. "We're disappointed we didn't launch today, but we're convinced the launch team...made the correct decision," said John Creighton, STS-36 Commander. Creighton and his crew plan to return to Johnson Space Center to practice launch and emergency abort procedures in a Shuttle simulator, then return to Florida for the next attempt. NASA said that repeated delays have cost more than \$2.7 million. ["Winds, Clouds Ground Atlantis in 5th Delay," **THE MIAMI HERALD**, p. 4A, Feb. 27, 1990, Halvorson, **FLORIDA TODAY**, Feb. 27, 1990, "6th Atlantis Try Will Come Wednesday, Still Quite Iffy," **THE ORLANDO SENTINEL**, p. A-7, Feb. 27, 1990.]

February 27:

COUNTY ROAD PLANS

Among the Brevard County road projects for 1990 is the projected widening of North Courtenay Parkway from Grant Street north of the Barge Canal to the Kennedy Space Center to begin in April at a cost of \$9 million. [Reed, **FLORIDA TODAY**, p. 2B, Feb. 28, 1990.]

□

CREW TRAINS FOR LAUNCH

Commander John Creighton, Pilot John Caspers and Mission Specialist David Hilmer returned to Kennedy Space Center today after spending most of the previous two days at Johnson Space Center flying mock Shuttle missions in a simulator. Mission Specialists Richard "Mike" Mullane and

Pierre Thuot remained at Kennedy Space Center. The five delays of the Atlantis mission is a record for post-Challenger missions. The delays have cost nearly \$3 million. [Halvorson, **FLORIDA TODAY**, p. 1A, Feb. 27, 1990.]

□

STS-36 CREW READY, AGAIN

"We're ready. Boy, are we ready," Mission Specialist Richard "Mike" Mullane said today. Liftoff was scheduled between midnight and 4 a.m., but at 12:50 NASA held for rain showers in the Kennedy Space Center area. Countdown for the 34th Shuttle mission was continuing smoothly today until the hold after midnight as launch technicians completed filling Atlantis' external fuel tank with 528,300 gallons of liquid oxygen and liquid hydrogen. Air Force meteorologists earlier in the day had predicted weather might improve enough to permit launch early on the 28th. [Halvorson, **FLORIDA TODAY**, p. 1A, Feb. 28, 1990, Glisch, **THE ORLANDO SENTINEL**, Feb. 28, 1990, Leary, **THE NEW YORK TIMES**, p. A11, Feb. 28, 1990.]

February 28:

ATLANTIS LAUNCHES 2:50 A.M.

Atlantis carried its military cargo into orbit this morning after a 2:50 a.m. liftoff from its Kennedy Space Center launch pad. The bus-sized cargo was deployed at about 5:50 a.m. Launch was delayed some two hours as the launch team waited for rain and clouds to move out of the area. Weather had been part of four of the five previous launch delays. Launch Director **Bob Sieck** said the astronauts had been "pretty quiet and very patient." NASA Administrator **Richard Truly** congratulated the launch team, saying, "It was a tough one to get off, but a great job."

The cargo was deployed using a new Shuttle system - the Stabilized Payload Deployment System - which rolls the cargo from the payload bay rather than ejecting it with a spring-like device or dropping it over the side of the Shuttle with its robot arm.

"For nice big satellites like the one on Atlantis, payload bay space is at a premium," said **John Pike**, Associate Director of Space Policy for the Federation of American Scientists in Washington, D. C. "This system is the most compact way to pop the payload out into orbit. It permits you to use a greater percentage of the cargo bay for payloads rather than deployment devices." [Halvorson, **FLORIDA TODAY**, p. 1A, Mar. 1, 1990.]

MARCH

March 1: MURRAH HEADS COLUMBIA'S PROCESSING

Today Bascom Murrah III takes over as Columbia's Processing Manager; previously he had supervised ten engineers as Chief of the Auxiliary Power Unit and Hydraulic Systems Section in the Vehicle Engineering Directorate. "I felt like I had my own little piece of it," he said. "Here you've got a bigger piece and a lot more responsibilities." Director of Shuttle Management and Operations at Kennedy Space Center, Jay Honeycutt, said of Murrah, "He certainly is the sort of fellow that I want in our organization. He's aggressive, intelligent and personable. He's interested in getting the job done." Murrah joined KSC in 1968 as an Apollo engineer. [Banke, *FLORIDA TODAY*, p. 9E, May 27, 1990.]

□ SPACEPORT USA: ATTENDANCE

Attendance at Spaceport USA, Florida's No. 4 tourist attraction, was down slightly in February, officials said today. The number of visitors fell to 255,130 last month, off 1.9 percent from February 1989, off 1.9 percent from February 1989. ["Spaceport USA," *THE ORLANDO SENTINEL*, March 2, 1990.]

March 3: REPORT: REPLACE SHUTTLES

The National Research Council says the future of spaceflight does not include the Space Shuttle. The council called for a new, less-complicated, more reliable system to replace the Shuttle. The panel urged the development of alternatives to the Shuttle: "Eventually, a plan for a graceful phasing out of the shuttle system should be prepared. Because operations of the Space Shuttle will continue to be labor intensive and expensive, because the system is not robust and because the system will probably reach the end of its useful life sometime between 2000 and 2010, the committee believes that a successor to the Shuttle eventually will be necessary for human transport to orbit."

Regarding the Space Station, the committee agreed with NASA that a permanently manned space station is necessary for space exploration, but said the current design is stretched too thin to meet the demands of scientists and also be a depot for missions into deep space. "The question even arises whether an additional station, complementary to the first and designed as a transportation node, will eventually be necessary to accommodate the later, more-demanding mission," the report stated.

[Lunner, **FLORIDA TODAY**, pp. 1A-2A, March 3, 1990, Reidy, **THE ORLANDO SENTINEL**, p. A-1 & A-15, March 3, 1990.]

March 4: **ATLANTIS GLIDES TO EARTH**

"Congratulations on a great flight, guys, and welcome back," astronaut **Steve Oswald** said, speaking from Mission Control to the Atlantis crew as it touched down at 1:08 p.m. EST. The mission ended at Edwards Air Force Base, CA, four days and 10 hours after launch from Kennedy Space Center. "You can probably tell by the smiles on our faces we had a great time," Mission Commander **John Creighton** told a crowd of 100. Pilot **John Casper** said, "As one of the rookies on board, I just say, 'Wow! What a fantastic experience'." ["Shuttle Set to Land Today; Weather 'Marginal, But Acceptable," **THE ORLANDO SENTINEL**, p. A-7, March 4, 1990, Brown, **FLORIDA TODAY**, p. 1A, March 5, 1990, "The Shuttle Ends Flight for Military," **THE ORLANDO SENTINEL**, p. A-3, March 5, 1990.]

March 6: **HYDRAULIC LEAK: ATLANTIS**

A leaking hydraulic system which has fouled Atlantis' tail section is delaying the return of the Orbiter to Kennedy Space Center from California. "We know what we have to do and have looked at all the schedules. We're still looking forward to a one-day ferry flight beginning Saturday [March 10] morning," said space center spokeswoman **Lisa Malone**. Post-flight inspections showed several spots of hydraulic fluid near the three main engines, the right main landing gear and the place where Atlantis is attached to its external tank, officials said.

When workers entered the aft compartment where the main engines are located, they found the entire area coated with a thin film of hydraulic fluid, Malone said. They began immediately to clean the spill and found the source: a one-inch slit in the outer covering of a steel, rubber-coated tube that feeds highly pressurized hydraulic fluid from pump No. 1. The slit, it is thought, was probably caused by a problem with the connection between the pump and the hose, which allowed fluid improperly to flow between the steel tube and its covering.

Other post-flight examinations revealed that two of the Shuttle's steering thrusters failed during the mission and must be replaced before Atlantis' next flight in July. The crew used other thrusters to maneuver safely and complete the mission, a NASA spokesman said. [Banke, **FLORIDA TODAY**, p. 1B, March 6, 1990, Banke, **FLORIDA TODAY**, p.4A, March 7, 1990, "Gear Glitch No Problem, NASA Says," **THE MIAMI HERALD**, March 27, 1990.]

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TITAN LAUNCHES HURT WILDLIFE

A study conducted by the U. S. Air Force and reviewed by the U. S. Fish and Wildlife Service says up to 200 Florida scrub jays and 12,000 southeastern beach mice could die because of 27 Titan launches planned between 1991 and the end of 1995. Because of the study, the Air Force has been granted an Endangered Species Act exemption and will be allowed to "take" up to 200 scrub jays and 12,000 of the beach mice from the area next to the Titan launch complexes 40 and 41. **Donald Palmer**, an Acting Field Supervisor with the Fish and Wildlife Service in Jacksonville, said that "taking" means harassing, harm, pursuing, capturing or collecting animals. The exemption does not extend to any other areas, he said. [Halvorson, **FLORIDA TODAY**, pp. 1A-2A, March 7, 1990, Lancaster, **THE ORLANDO SENTINEL**, pp. A-1 & A-7, Feb. 27, 1990, Lancaster, **THE ORLANDO SENTINEL**, pp. D-1 & D-4, March 10, 1990.]

March 7:

ROLLOUT SCHEDULED

Discovery will roll to Launch Pad 39B March 15, a day earlier than expected. Rolling out earlier will permit technicians to begin loading propellants into the Shuttle's nose and tail steering jets ahead of schedule and will also allow workers to begin stacking solid rocket boosters for Columbia's May 9 mission at an earlier date. Today, workers mated Discovery to its external tank and solid rocket boosters. Meanwhile, Atlantis was being readied for its return from California and was expected to arrive at the Shuttle Landing Facility late on March 17. [Halvorson, **FLORIDA TODAY**, p. 5A, March 8, 1990, Banke, **FLORIDA TODAY**, p. 4A, March 15, 1990.]

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LDEF CONTINUES SURPRISES

The Long Duration Exposure Facility [LDEF], now undergoing investigation at Kennedy Space Center, became slightly radioactive during its stay in space. The amount of radiation it exposes workers to is less than they would get at the beach in one day. "There's an awful lot of information coming from LDEF that will help us design future spacecraft and allow them to survive in space," said **Bill Kinard**, Chief Scientist for LDEF in remarks made to a dinner meeting of the Cape Canaveral Press Club. ["Seeds From Space Seem To Be Normal," **THE ORLANDO SENTINEL**, p. A-5, March 3, 1990, Banke, **FLORIDA TODAY**, p. 5A, March 8, 1990.]

March 8: ATLANTIS LIFTOFF PROBLEM REVEALED

Atlantis had trouble with its hydraulic system during launch, but flight controllers did not think it was serious enough to take actions, NASA said today. The leaking hose was removed from the Orbiter March 7 and sent to Rockwell International (Downey, CA) for analysis. In California, Rockwell inspectors have been unable to locate the source of the leak. NASA said that it believes the leaking hose was a quirk and not a generic problem. [Banke, **FLORIDA TODAY**, pp. 1A-2A, March 9, 1990, "Fluid Lost As Atlantis Split A Hose," **THE ORLANDO SENTINEL**, March 8, 1990.]

□ KSC DEDICATES NEW BUILDING

Kennedy Space Center officials today dedicated a new \$28 million, six-story office building - the Operations Support Building - which will house about 1,700 NASA and contractor employees in the Space Shuttle Engineering Support Division. The building, located near the Vehicle Assembly Building, will provide permanent office areas for workers now located in modified railroad cars, portable trailers and prefabricated modules. W & J Construction Corp. (Cocoa, FL) started construction on the building in September 1988 and completed it three months ahead of schedule. The building was designed by HWH Architects, Engineers and Planners (Orlando, FL). ["KSC Dedicates New Building," **FLORIDA TODAY**, p. 2A, March 9, 1990.]

March 10: ATLANTIS ATTEMPTS RETURN

Today Atlantis is to begin its return journey to Kennedy Space Center from its landing site at Edwards Air Force Base, CA; it is expected to arrive at the space center tomorrow at sunset. If weather delays the last leg of the flight, the Orbiter and its carrier plane, will not touch down at the Shuttle Landing Facility till March 12. [Banke, **FLORIDA TODAY**, p. 5A, March 10, 1990, Halvorson, **FLORIDA TODAY**, p. 1A, March 11, 1990, Higginbotham, **FLORIDA TODAY**, March 12, 1990.]

March 13: ATLANTIS RETURNS TO KSC

Atlantis, atop its Shuttle Carrier Aircraft, touched down at Kennedy Space Center's Shuttle Landing Facility at 5:51 p.m. today. "It's always good to get them back after a good flight," said KSC Director **Forrest McCartney**. "We're going to turn it around again and get it out of town again in July." Space Center spokeswoman Lisa Malone said, "It was a smooth flight. We

didn't have any problems." [Banke, **FLORIDA TODAY**, p. 2A, March 13, 1990, Halvorson, **FLORIDA TODAY**, p. 1A, March 14, 1990.]

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TITAN READY FOR LAUNCH

"All systems are go. The rocket is ready, the range is ready and we intend to push the button at 6:49 a.m. and get that sucker off the ground," said **Ed Browne**, President of Martin Marietta Commercial Titan Inc. Martin Marietta spokeswoman **Judith Stowell** said there is only a five percent chance that weather will cause a delay tomorrow. The launch will be the second commercial liftoff for Martin Marietta; the first was on December 31, 1989, when a Titan carried British and Japanese communications satellites into orbit. [Halvorson, **FLORIDA TODAY**, p.4A, March 14, 1990.]

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ASTRO-1 ON SCHEDULE, NOW

"We're anxious. We want to see it go," said **Glenn Snyder**, NASA Payload Manager for ASTRO-1, an astronomical observatory which had previously been scheduled for launch March 6, 1986. The Challenger accident in January of that year caused a five-year delay for the mission. On March 17, the spacecraft will move from the Operations and Checkout Building to the Orbiter Processing Facility, where it will be installed in Columbia. Mating of Columbia is scheduled for April 8 and rollout is set for April 16 with a May 9 launch date. [Halvorson, **FLORIDA TODAY**, p. 4A, March 14, 1990.]

March 14:

INTELSAT STRANDED

The INTELSAT VI spacecraft was launched from Cape Canaveral Air Force Station this morning at 6:52 a.m., but 25 minutes after launch, the satellite and its 17,000-pound motor failed to separate properly from the rocket's second stage. Ground controllers were finally able to split the satellite and rocket, but the satellite was stranded in an egg-shaped orbit ranging from 96 to 214 miles above earth. "This maneuver allowed the satellite to be placed in a safe low Earth orbit for the time being while options, including a Shuttle recovery, are examined," said **Dean Burch**, Director General of INTELSAT. NASA spokesman **Dick Young** said, however, that it was unlikely that a Shuttle would mount a rescue mission in the near future. [Halvorson, **FLORIDA TODAY**, p. 1A-2A, March 15, 1990, Burnett, **THE ORLANDO SENTINEL**, March 15, 1990, Oates, **THE ORLANDO SENTINEL**, pp. A-1 & A-14, March 15, 1990, Oates, **THE ORLANDO SENTINEL**, p. A-13, March 16, 1990.]

March 15:

DISCOVERY'S LANDING GEAR

Rollout to Launch Pad 39B was delayed twelve hours while Kennedy Space Center technicians worked on a problem concerning a nut on the axle assembly of the Orbiter's landing gear. A problem with the landing gear of both Atlantis and Columbia has been detected and engineers are unsure whether Discovery has the same problem. "We don't want to risk landing Discovery until we see if the problem would affect the gear during a landing," said space center spokesman **Bruce Buckingham**. Columbia's axle has been sent back to its manufacturer - Menasco Manufacturing Co. (Burbank, CA). "We don't know how long it will take to analyze. They will be trying to prove it's safe to land in its current configuration," said **Lisa Malone**, KSC spokeswoman. NASA is looking for results by March 18; if the nut has to be replaced a roll back to the Vehicle Assembly Building and demating will be necessary. [Glisch, **THE ORLANDO SENTINEL**, p. A-3, March 16, 1990, Halvorson, **FLORIDA TODAY**, p. 1A, March 16, 1990, Banke, **FLORIDA TODAY**, p. 4A, March 17, 1990.]

March 16:

TITAN'S WIRING BLAMED

Faulty wiring in a Titan 3 failed to relay signals to separate a satellite from the rocket's second stage, said manufacturer Martin Marietta today. Workers failed to find the faulty electrical wiring during pre-launch tests of the commercial rocket. Martin spokesmen said the company will change its pre-launch procedures to prevent the same kind of mistake from happening again. [Banke, **FLORIDA TODAY**, p. 1A, March 17, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-6, March 17, 1990.]

March 18:

COUNTDOWN TEST STARTS

"It looks good for pressing on toward April 12," said Commander **Loren Shriver** after he and his four crew mates landed at Kennedy Space Center's Shuttle Landing Facility at 12:10 p.m. today for a two-day countdown demonstration test. Shriver went on to say that "Discovery and Atlantis both have been cleared for flight, so there's no longer any worry about our nosewheel." Pilot **Charles Bolden** said that an early launch date was possible. "They have really been busting their buns down here to get the vehicle ready for us," he said. "We're kind of hoping deep down inside that we can talk some people into moving it up, because we're ready to go." Mission Specialist **Steven Hawley** discounted rumors that the STS-31 crew would mount a rescue effort for the recently stranded INTELSAT. ["Discovery Readied for Launch Test," **THE ORLANDO SENTINEL**, p. A-

17, March 18, 1990, Higginbotham, **FLORIDA TODAY**, p. 1A, March 19, 1990.]

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OWL WATCH

Kennedy Space Center workers are keeping an eye on two owls who are roosting on Launch Pad 39B near the Space Shuttle Discovery. A video camera is trained on the birds, according to space center spokeswoman **Lisa Malone**. Fish and Wildlife Service employees will visit the nest today. ["KSC Gives A Hoot About Owl's Nest," **FLORIDA TODAY**, March 18, 1990, "KSC Watches 2 Launch Pad Owls," **FLORIDA TODAY**, p. 8B, March 19, 1990, Higginbotham, **FLORIDA TODAY**, p. 4A, March 20, 1990, Jacobson, **THE ORLANDO SENTINEL**, March 21, 1990.]

March 19:

ASTRONAUTS DRILL

The Discovery crew worked with the slide-wire baskets used in emergency launch pad escapes today. Commander **Loren Shriver** and Pilot **Charles Bolden** practiced landings in the Shuttle Training Aircraft. Tomorrow the astronauts will put on their space suits and enter Discovery for the final three hours of the countdown demonstration test.

Meanwhile, NASA continued to investigate the landing gear nut problem which surfaced last week. Commander Shriver said the mission is still on target for launch April 12. Shriver has been involved in briefings on the problem: "The assumption is that it's [the crooked nosewheel bolt] probably there because all the other landing gears that they looked at had a certain amount of that problem evident. We think the data points that way, but upper-level management gets a chance to hear that and decide." [Higginbotham, **FLORIDA TODAY**, p. 4A, March 20, 1990.]

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HALL OF FAME OPENS

Mercury astronaut **Gordon Cooper** was on hand for the opening of the U. S. Astronaut Hall of Fame south of Titusville, FL, today. The Hall of Fame pays tribute to the heroics of Cooper, **Alan Shepard**, **Wally Schirra**, **John Glenn**, **Deke Slayton**, **Scott Carpenter** and the late **Gus Grissom**. **Gunter Wendt**, who was in charge of the Mercury launch complexes, said of those astronauts, "they had to endure a helluva lot of physical testing that today is no longer necessary. All the survival tests, eating snakes and things like that."

At the opening ceremonies, Gordon Cooper recalled his Faith 7 flight. "Everything was going well until the 19th orbit. We lost the electrical

systems and all I had was a push-pull rod and eyeballs out the window for control - and a wristwatch for timing. I didn't have much choice but to handle the situation. If I didn't get myself down nobody else would." [Halvorson, **FLORIDA TODAY**, p. 10E & 9E, March 11, 1990, Halvorson, **FLORIDA TODAY**, p. 1A, March 20, 1990.]

March 20:

TITAN WIRING BLAMED

Martin Marietta Corp.'s Titan 3 failed to deploy a \$150 million satellite properly because the vehicle was wired to carry two satellites instead of one, according to company officials. "It was a case where the computer people said they would launch the first payload and the wiring people thought that meant the bottom payload," if two satellites had been stacked in the nose cone, said **Steve Frank**, a Martin Marietta spokesman. "There was just nothing at the separation device to receive the signal," he said. [Banke, **FLORIDA TODAY**, p. 1A, March 21, 1990, "Mistake In Wiring Doomed Intelsat," **THE ORLANDO SENTINEL**, p. A-5, March 21, 1990.]

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PRACTICE COUNTDOWN COMPLETED

Crew members for STS-31 participated in a two-day practice countdown at Kennedy Space Center, then returned to Johnson Space Center. The crew includes: **Commander Loren Shriver**, **Pilot Charles Bolden, Jr.** and **Mission Specialists Bruce McCandless II, Kathryn Sullivan and Steven Hawley**. [Halvorson, **FLORIDA TODAY**, p. 4A, March 21, 1990.]

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DEBUS MAKES HALL OF FAME

The late **Kurt Debus**, first Director of Kennedy Space Center, was inducted today into the Junior Achievement of East Florida's Business Hall of Fame in a special ceremony today. Debus was chosen for having created the visitors center at the space center and for having opened up the center to bus tours. ["Junior Achievement Slates Hall of Fame Induction Event," **FLORIDA TODAY BUSINESS MONDAY**, p. 2, March 12, 1990.]

□

LANDING GEAR SAFE

"We have determined that the gear is going to be safe for landing," said NASA spokeswoman **Lisa Malone**. "We're not going to roll back and we're going to press on with the rest of our activities at the launch pad." A roll back to the Vehicle Assembly Building was considered when workers found a crooked 6-inch diameter nut on the axles of the nosewheel landing gear of Atlantis and Columbia. Columbia's axle assembly was returned to its manufacturer - Menasco Manufacturing Co. (Burbank, CA)

where tests showed the gear safe for landing, according to NASA spokesman Mark Hess. Shuttle Program Director **Robert Crippen** is expected to give final clearance for launch on March 22. [Halvorson, **FLORIDA TODAY**, p. 4A, March 21, 1990.]

March 21: **DELTA 2 LAUNCH SET**

Cape Canaveral Air Force Station will light up tonight when a McDonnell Douglas Space Systems Co. Delta 2 is launched at 10:02 p.m. from Launch Complex 17. The Delta is carrying a Global Positioning System Satellite. The launch vehicle is 128 feet tall and has three stages. The first two stages are liquid fuel and the third has solid propellants. The 207,000 pounds of thrust is augmented by nine strap-on rockets. The launch window tonight is 21 minutes. ["Delta 2 Set for Launch Tonight," **FLORIDA TODAY**, p. 4A, March 21, 1990.]

March 22: **SATELLITE RESCUE MEETING**

NASA officials meet today at Johnson Space Center (Houston, TX) with owners of the stranded INTELSAT communications satellite to discuss a possible Space Shuttle rescue mission. **Hal Lambert**, Manager of Integration Operations at JSC said of his INTELSAT counterparts, "They are just going to come in and give us some information about where the spacecraft is and its condition and so forth. We are going to discuss whether it's possible to get the satellite." NASA says it doesn't know how much it would charge today because the agency no longer does commercial business and there is no published rate schedule. Before the Challenger accident, astronauts saved five satellites, bringing three home and repairing two in orbit. At the time NASA charged commercial owners about \$15 million apiece. [Oates, **THE ORLANDO SENTINEL**, p. A-5, March 21, 1990, Brown, **FLORIDA TODAY**, p. 7A, March 22, 1990.]

□ **DISCOVERY SEAL CHECK TODAY**

While engineers continue to review test data, a potentially leaky seal on one of Discovery's main engines will be inspected and, perhaps, replaced. Also today, NASA decided that discolored fuel taken from a launch pad storage tank was safe to use on board the Orbiter. NASA spokesperson **Lisa Malone** said the discoloration was caused by iron compounds and circulating the fuel brought it within technical specifications. [Brown, **FLORIDA TODAY**, p. 7A, March 22, 1990.]

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DELTA 2 LAUNCH DELAYED

Unacceptable weather forced the postponement of a Delta 2 launch scheduled for today. The liftoff was rescheduled for 9:41 a.m. March 26. The Delta 2 will carry a Navstar Global Positioning System satellite; the launch will be the seventh of 21 scheduled to occur at Cape Canaveral Air Force Station in the next few years. [Halvorson, **FLORIDA TODAY**, p. 7A, March 22, 1990.]

March 23:

SATELLITE RESCUE POSSIBLE

Robert Crippen, Director of the Space Shuttle Program, said today that it is possible that NASA will be able to mount a rescue mission to save a \$150 million international communications satellite (INTELSAT) which was stranded after launch on March 14. He said NASA engineers and officials of the International Telecommunications Satellite Organization, which owns the INTELSAT, have decided to look into the possibility of delivering a new motor to the satellite by means of the Space Shuttle.

Associate Administrator for Space Flight **Bill Lenoir** - Crippen's boss - has expressed interest in NASA's attempting the rescue. "We looked at two things: One was we could take a motor up, and go ahead and boost it up...or could we return it," Crippen said. "Our initial look-see from our safety panel, was that they didn't see any show-stoppers, although in their normal prudent way they want to go through and do a detailed scrutiny of it to assure that they don't see any problem." [Banke, **FLORIDA TODAY**, p. 4A, March 23, 1990, "NASA: Satellite Rescue Feasible," **THE MIAMI HERALD**, p. 4A, March 23, 1990, Lunner, **FLORIDA TODAY**, p. 8A, March 24, 1990, Oates, **THE ORLANDO SENTINEL**, pp. C-1 & C-6, March 24, 1990.]

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EARLY LAUNCH FOR DISCOVERY?

"It's our goal to go into the Flight Readiness Review with the capability to launch as early as we can the week of April 9, but that doesn't mean the program is going to sign up for a date earlier than April 12," said Launch Director **Bob Sieck**. "We've still got a lot of work left to do and we don't have Hubble in the Shuttle yet."

Today workers successfully replaced a teflon-coated metal seal between main engine number 2 and a 12-inch diameter fuel line on Discovery. A joint NASA-U.S. Air Force satellite - the Combined Release and Radiation Effects Satellite - arrived today at the space center's Payload Hazardous Servicing Facility. in Hangar AE at

Cape Canaveral Air Force Station, the wide-field camera of the NASA-West German Roentgen Satellite (ROSAT) was installed, as well. [Banke, **FLORIDA TODAY**, p. 8A, March 24, 1990.]

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COMPANIES HONORED

The U. S. Small Business Administration named McDonnell Douglas as the 1990 Distinguished Prime Contractor of the Year for Region 4, which is comprised of eight states. For the second consecutive year, EG&G Florida Inc. has been named "Large Prime Contractor of the Year" at Kennedy Space Center. [Bailey, **FLORIDA TODAY**, p. 8A, March 24, 1990.]

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NEW SHUTTLE FACILITY DEDICATED

"Today we realize a dream that's been in the making for nearly a decade - a centralized, consolidated Orbiter logistics depot that can accommodate NASA's growing Shuttle flight rate," said **Albert Martin**, Vice President and General Manager of Rockwell International Corp.'s Space Transportation Systems Division in Florida. Martin spoke at the dedication ceremony for a new facility to repair and overhaul Space Shuttle components. Each Orbiter has some 22,000 components, many of them requiring overhaul or repair.

Rockwell's new facility will be able to increase the cost-effectiveness and responsiveness of the company's Shuttle support activities, according to Martin. "In the early years of the Shuttle Program, Orbiter component repairs were averaging 150 to 200 days per component. This new expansion will enable us to eventually cut that figure to about 30 days." [Halvorson, **FLORIDA TODAY**, p. 8A, March 24, 1990.]

March 25:

DELTA 2 LAUNCHED TODAY

A Delta 2 carrying a navigation satellite was launched tonight a day ahead of schedule, lifting off at 9:45 p.m. from Cape Canaveral Air Force Station. An effort to launch March 21 was scrubbed due to high winds. The Delta carried a \$65 million Global Positioning System Satellite which will allow military vehicles to determine their location within 50 feet and in some cases to within 10 feet, their speed within a fraction of a mile per hour and the precise time within a millionth of a second. The satellite is the seventh of a planned 21. [Banke, **FLORIDA TODAY**, p. 5A, March 25, 1990.]

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VAN HOFTEN HONORED

Tonight former astronaut James "Ox" van Hoften will be honored at the Cape Canaveral Chapter of the Air Force Association's seventh annual Astronaut Tribute Night. Van Hoften performed four space walks to repair two crippled satellites and was responsible for in-flight experiments. He also helped develop in-flight software for Shuttle missions. He left NASA in 1986 after eight years as an astronaut. ["Air Force Club Honors Astronaut," **FLORIDA TODAY**, p. 8E, March 25, 1990.]

March 26:

HST READY FOR LOADING

Kennedy Space Center workers today prepared the Space Shuttle Discovery to receive the 25,000-pound Hubble Space Telescope in preparations for the April 12 launch of the Orbiter. The loading process itself is expected to take about eight hours. "It's something that has to be done very gradually because of the clearances. You can't just roll it in," said NASA spokesman George Diller. The crew for the Hubble Space Telescope mission includes Commander Loren Shriver, Pilot Charles Bolden and Mission Specialists Kathryn Sullivan, Bruce McCandless and Steven Hawley. [Brown, **FLORIDA TODAY**, p. 2A, March 26, 1990, Higginbotham, **FLORIDA TODAY**, p. 4A, March 27, 1990.]

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PARKWAY WIDENING BEGINS

North Merritt Island homeowners watched as Brevard County officials broke ground for the one-year, \$6.4 million project to widen North Courtenay Parkway [also known as State Road 3] from the Barge Canal north to Kennedy Space Center. Space Center Director Forrest McCartney was on hand to see county employees begin scraping away grass today. He remarked that the four-lane road would be a big help to KSC workers. [Nagy, **FLORIDA TODAY**, p. 1B, March 27, 1990.]

March 27:

MIDGES IN CLEAN ROOM

Workers found dozens of midges - tiny, biting insects which resemble gnats - in the "clean room" of Launch Pad 39B at Kennedy Space Center. The insects were on Discovery's closed cargo bay doors and flew into the clean room after the Hubble Space Telescope was delivered to the pad March 25. The telescope itself was protected in a plastic wrapping. "We will not open Discovery's cargo bay doors or take Hubble out of its [wrapping] until we have control of the situation," said space center spokesman George Diller.

Meanwhile, technicians successfully tested the hydrogen portion of Discovery's main propulsion system. The test was required after workers repaired a connection in a main engine. NASA started a two-day test that simulates the start of the three main engines and no problems were revealed today. [Banke, **FLORIDA TODAY**, p. 1A, March 28, 1990.]

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NASA BOOSTS BREVARD ECONOMY

NASA, recipient of a healthy budget increase, will spend more than \$1.7 billion to support 44,000 jobs in Brevard County this year, according to a study by the University of Central Florida. The Impact Study, which was released this morning, looks at the impact of Kennedy Space Center on Brevard County and Orlando since 1988. The study's director and writer, **Bradley Braun**, said, "We need to stop thinking about Brevard County and Orlando and start thinking about one regional economy." Since 1988 NASA-related jobs in Brevard County have risen 21 percent to 44,200 jobs. **Karl Kristofferson**, spokesman at the space center, said that by 1995, the center's total employment could reach an Apollo-era high of 25,000. NASA has plans to expand its Shuttle schedule and to build a Space Station. [Oates, **THE ORLANDO SENTINEL**, March 28, 1990, Solomon, **FLORIDA TODAY**, p. 1A, March 28, 1990.]

March 28:

DR. LONG ON PBS

Dr. Irene Long, head of the Medical and Environmental Health Office at Kennedy Space Center will be featured tonight in a Public Broadcasting Service documentary titled "Black Stars in Orbit." The program celebrates the achievements made by African Americans in the space program. [Higginbotham, **FLORIDA TODAY**, p. 8E & 7E, March 25, 1990.]

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NASA ELIMINATES BUGS

Live insects which delayed the loading of the Hubble Space Telescope into the cargo bay of Discovery have been cleared out of the immediate area. Now NASA must eradicate technical "bugs" which invaded Discovery's main engines during a two-day test that concluded today. A faulty controller will be replaced by a spare and an igniter in main engine number one will be replaced. The igniter apparently lost power briefly during the test; it had worked perfectly during other tests.

NASA spokesman **Bruce Buckingham** said neither problem represented a threat to the planned April 12 launch date. Kennedy Space Center managers met today to decide whether the center was ready to support a launch. Shuttle Program Manager **Jay Honeycutt** announced: "There are

no significant issues at this point and KSC is ready to proceed toward the launch of Discovery." ["Bugs Won't Ruin Launch, NASA Says," **THE ORLANDO SENTINEL**, March 28, 1990, Banke, **FLORIDA TODAY**, p. 1A, March 29, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-17, March 29, 1990.]

March 29: **HUBBLE TESTED**

Six hours after loading began, the Hubble Space Telescope was firmly in place in Discovery's cargo bay today. Several electrical connections between Hubble and Discovery remain to be completed tonight. A six-hour test to determine whether any problems exist will be started tonight as well. NASA managers meet March 30 and 31 to determine a firm launch date for Discovery. Although Kennedy Space Center workers have a full agenda of activity planned before launch, managers think it is possible to launch a day or two earlier than April 12. On April 1, a 52-hour pad confidence test begins. The test, in which NASA will determine how the HST's various instruments are operating, will provide scientists and engineers with a base-line to use when determining if the telescope incurs any damage during liftoff. [Higginbotham, **FLORIDA TODAY**, p. 4A, March 30, 1990, "Billion-Dollar Telescope On Shuttle; Testing Next," **THE MIAMI HERALD**, March 30, 1990.]

□ **TITAN 3 BOOSTER LANDS**

The Titan 3 rocket that launched a \$157 million communications satellite but failed to put it in the proper orbit either burned up in the atmosphere or fell into the ocean, according to Army Major **Thomas Niemann**, a U. S. Space Command spokesman. "We don't have any indication that it survived" re-entry, Niemann said, but any fragments returning to Earth would probably have landed in the Pacific Ocean southeast of Taiwan. A spokesman for INTELSAT, **Tony Trujillo**, said of the satellite, "We can keep it there for several months, if not up to a year." ["Rocket Falls to Earth, But Its Fate A Mystery," **THE MIAMI HERALD**, March 30, 1990.]

March 30: **HST LAUNCH PREPARATIONS**

Astronaut **Bruce McCandless** joined Kennedy Space Center workers at the launch pad to link electrical connections between the Hubble Space Telescope and Discovery. KSC spokesman **Bruce Buckingham** said a test of the connections would be made today.

McCandless also examined the telescope for any sharp edges that could snag the spacesuits he and fellow Mission Specialist **Kathryn Sullivan**

would wear if a spacewalk were necessary during the mission. On March 31, engineers will test a replacement controller on Discovery's main engine number 3. The part was switched out on the 29th because an internal circuitry problem appeared during a simulated engine-start test. This weekend, the fuel tanks will be purged prior to propellant loading and the instruments aboard the Hubble Space Telescope will be tested. [Higginbotham, FLORIDA TODAY, p. 8A, March 31, 1990.]

March 31: **DISCOVERY GOES APRIL 10**

NASA moved up the launch of Discovery two days to April 10. The date was set at the conclusion of the Flight Readiness Review at which Shuttle Managers determined that the space agency and its contractors were prepared to launch. "The Shuttle team is ready to fly," said William Lenoir, Associate Administrator for Space Flight. "Hubble is one of the most exciting payloads ever launched aboard the Shuttle and we are looking forward to the mission." Liftoff is scheduled for 8:47 a.m. April 10, with landing expected at Edwards Air Force Base, CA, five days later. [Banke, FLORIDA TODAY, p. 1A, April 1, 1990.]

□ **VAN HOFTEN HONORED**

James "Ox" van Hoften, a two-time Shuttle Astronaut, was honored tonight by the Cape Canaveral Chapter of the Air Force Association for his work in space. Chapter President **Chris Bailey** said, "Every year in Cocoa Beach, the Cape Canaveral Chapter hosts a dinner to honor an astronaut for some particular achievement. Ox came to mind when Solar Max reentered the atmosphere late last year. On hand to induct van Hoften as a Doolittle Fellow was Kennedy Space Center Director **Forrest McCartney**. "I think this is exciting," said van Hoften. "Last year I gave a speech at this dinner for a very good friend of mine, Dick Covey. He flew with me and it was quite emotional to be involved with that event." A \$1,000 contribution will be made in van Hoften's name to the Air Force Association's Aerospace Education Fund. [Banke, FLORIDA TODAY, p. 6A, April 1, 1990.]

APRIL

April 2:

UTILITY ANNEX ACCIDENT

A broken pipe in a utility annex near the Vehicle Assembly Building sprayed water onto a cabinet containing a number of electrical connections. The accident caused short circuits and electrical power blinked on and off throughout Kennedy Space Center, according to center spokesman Dick Young. Launch Control Center computers monitoring tests of Discovery and the Hubble Space Telescope were shut down till 12:01 a.m. April 3. Young said that it was not yet known what effect the outages will have on the April 10 launch of Discovery. [Banke, **FLORIDA TODAY**, p. 1A, April 3, 1990.]

April 3:

LAUNCH PREPARATIONS: DISCOVERY

Today at Kennedy Space Center, technicians will continue to prepare Discovery's aft compartment for launch by making final inspections, making last minute installations and cleaning the area housing the main engines. They will also continue charging Hubble Space Telescope batteries and begin preparations to load the external tank with 500,000 gallons of liquid hydrogen and liquid oxygen by sending an inert gas through the tank to condition it to receive propellants. [Banke, **FLORIDA TODAY**, p. 1A, April 3, 1990.]

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DISCOVERY STILL ON SCHEDULE

Despite an accident which shut down air conditioning systems to critical areas of the Space Shuttle Complex and delayed tests, NASA officials remained confident that Discovery will launch on schedule April 10. Workers must finish testing science instruments and systems aboard the Hubble Space Telescope by 12:00 p.m. April 4 so pre-launch preparations can begin early on April 5. The accident occurred April 2 when a worker painting in a utility annex near the Vehicle Assembly Building either fell or tripped, causing a water pipe to break. The pipe sprayed water onto some electrical equipment, forcing a momentary power outage throughout the area. Air conditioning was shut down in the Launch Control Center where heat-generating computers were being used in tests on the HST and Discovery. In accordance with emergency procedures, power was turned off to Discovery and Hubble, then the computers were powered down.

A backup supply of electricity to the control center failed to take over and keep the firing room computers working. Today, workers converted the firing rooms to a newer system so the problem cannot occur again. An

investigation board, headed by **John Meyer**, a Manager in the Electrical Branch of Facilities Engineering, will convene for the first time tomorrow to begin gathering facts about the accident. The final report is not expected for a number of weeks, said space center spokesman **Bruce Buckingham**.

Air conditioning is back online in all critical areas at Kennedy Space Center; the complete system will be operational by the end of the week, according to KSC spokeswoman **Lisa Malone**. In addition, workers begin tomorrow erecting the first stages of Atlas and Delta rockets at Launch Pads 17 and 36 at Cape Canaveral Air Force Station and assembly will continue throughout the week. The rockets will launch two NASA experiments in June. [Banke, **FLORIDA TODAY**, p. 4A, April 4, 1990.]

April 4: **HST TESTS FALL BEHIND**

Despite tests on the Hubble Space Telescope having fallen behind schedule, NASA maintains that it remains possible that Discovery will lift off April 10. Though the tests were four hours beyond their scheduled completion time, all science instruments and control systems checked out fine, said Kennedy Space Center spokesman **George Diller**. Meanwhile, tests showed that a fuel cell on Atlantis had failed and must be replaced before the Orbiter's launch on July 9. A review board will be formed to look into the problem, according to spokesman **Dick Young**, who said the fuel cell problem will have no impact on Discovery's launch. [Banke, **FLORIDA TODAY**, p. 5A, April 5, 1990.]

April 5: **LAUNCH PREPARATIONS CONTINUE**

Today's pre-launch activities include the completion of the installation of the explosive device system on the Orbiter. The ordnance separates the mated Shuttle components. Workers also pressurized the on-board propellant tanks containing hydrazine and nitrogen tetroxide, the chemicals used to power Discovery's orbital maneuvering engines and steering thrusters. The launch tower's storage tanks were loaded with liquid hydrogen and liquid oxygen. The crew -Commander **Loren Shriver**, Pilot **Charles Bolden** and Mission Specialists **Kathryn Sullivan**, **Steven Hawley** and **Bruce McCandless** are expected to arrive at Kennedy Space Center at approximately 2 p.m. April 7. [Banke, **FLORIDA TODAY**, p. 5A, April 5, 1990.]



DISCOVERY LAUNCH ON TARGET

"We're right on schedule," said Kennedy Space Center spokeswoman **Lisa Malone** concerning the launch of Discovery set for April 10. Preparations today concentrate on readying the aft compartment where the three main engines are located. Final inspections are being made and protective covers are being removed in preparation for flight. Last minute items are being installed and the area cleaned. The Hubble Space Telescope's batteries will be charged by a ground supply until 68 hours before flight when cables will be disconnected and the payload bay's doors are closed. The final countdown begins at 3:00 p.m. April 7, just after the arrival of the five-member crew [see above]. Space Center spokesman **George Diller** said that long range forecasts indicate an 80 percent chance that weather will accommodate a launch on Tuesday [April 10]. [Banke, **FLORIDA TODAY**, p. 5A, April 6, 1990.]

April 7:

DISCOVERY CREW ARRIVES

Discovery's five-member crew arrived at Kennedy Space Center this afternoon and the countdown began for an anticipated 8:47 a.m. launch on April 10. On arrival Mission Specialist **Steven Hawley** said, "This is an exciting time for the launch team and it's obviously an exciting time for the crew." Mission Commander **Loren Shriver** commented, "This is the end of a fairly long wait. But I think in the case of this payload - the Hubble Space Telescope - it's well worth the wait." The crew whose members also include Pilot **Charles Bolden** and Mission Specialists **Kathryn Sullivan** and **Bruce McCandless** - arrived at 2 p.m. in three T-38 training jets. Call to stations for the launch team came at 2:30 p.m. and the countdown began a half-hour later. Space Center spokesman **George Diller** said there was a ten percent chance of a weather-related delay. ["Discovery Crew Rarin' To Go; Odds for Launch Improve," **THE MIAMI HERALD**, p. 6A, April 8, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-4, April 9, 1990, Halvorson, **FLORIDA TODAY**, p. 1A, April 8, 1990.]



LDEF STRIPPED OF EXPERIMENTS

The Long Duration and Exposure Facility platform, which was returned to Earth aboard Columbia in January, will be moved in May to storage to wait for another trip into orbit. Scientists have removed LDEF's space science and engineering experiments in a careful process which began in early February. Currently, technicians are examining the 12-sided spacecraft to determine how much damage was made by micrometeorites and artificial space debris. LDEF Chief Scientist **William Kinard** of Goddard Spaceflight Center (Greenbelt, MD) said, "The spacecraft looks

good as new. I wouldn't have any hesitation flying it again if I had another set of experiments." [Halvorson, **FLORIDA TODAY**, p. 8E, April 8, 1990.]

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MCCARTNEY TESTED FOR DRUGS

Kennedy Space Center Director **Forrest McCartney** was one of the first Space Center executives tested for drug use as part of the federal government's Drug-Free Work Place Program. Under this program, about 75 civil service employees in sensitive positions will be tested annually. The employees will be randomly chosen from 750 people who work with explosives, toxics or other dangerous material or are responsible for the protection of life and property, public health, safety and national security. McCartney described the testing as "fair, comprehensive and private." The program involves testing for cocaine and marijuana and will be done for amphetamine use if an employee is suspected of taking that drug. Anyone found with illegal drugs in their systems will be disciplined or terminated. Employees will not be disciplined if they voluntarily identify themselves, request help, successfully complete counseling or rehabilitation and refrain from using illegal drugs. At Kennedy Space Center contact KSC Drug Program Coordinator **David Dickinson** at 867-9246. [Halvorson, **FLORIDA TODAY**, p. 8E, April 8, 1990.]

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DISCOVERY: HEATER GLITCH

A short on Discovery's fuel tank heater was being investigated today, but NASA spokesmen said that the problem will probably not delay the launch of Discovery, scheduled for April 10. **Bruce Buckingham**, Kennedy Space Center spokesman, said the short could allow a sliver of ice about a sixteenth of an inch to form in the area of Discovery's aft external tank strut. Shuttle Director **Bob Crippen** said a decision to proceed with the countdown will come April 9. Weather appears to be good for launch with only a 10 percent chance that poor weather could violate launch requirements, according to Air Force weather expert **Ed Priselac**. On April 7, NASA managers adopted new weather guidelines that increase the allowable speeds under which a launch could occur. "They found that actually they can relax their constraints somewhat," Priselac said. [Higginbotham, **FLORIDA TODAY**, p. 1A, April 9, 1990, Wilford, **THE NEW YORK TIMES**, p. C9, April 9, 1990, Wilford, **THE NEW YORK TIMES**, p. B7, April 10, 1990.]

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ASTRONAUT EVANS DIES

Ronald E. Evans, who was Apollo 17 Command Module Pilot, died of a heart attack at his Arizona home today. He was 56. Evans called his December 1972 flight to the moon in Apollo 17 "the best experience I ever had in my life." He left the astronaut program in 1977 to become an officer with Western American Energy Corp. in Scottsdale, AZ. ["Former Astronaut Evans, 56, Dies of Heart Attack," **FLORIDA TODAY**, April 8, 1990.]

April 10:

DISCOVERY LAUNCH SCRUBBED

Following a smooth countdown, the launch attempt came to a halt four minutes before liftoff when an auxiliary power unit failed. NASA rules forbid a launch unless all three units operate perfectly. A fuel valve inside power unit No. 1 failed to close properly, allowing excess hydrazine to buildup. The buildup forced the turbine blades to spin faster than normal, a violation of launch rules. The No. 1 unit worked perfectly in Discovery's last mission - November 1989. Repair will take about seven days. Launch was scrubbed at 8:43 a.m.

On hand for the attempted launch of Discovery today were 160 relatives of the man - **Edwin Powell Hubble** - for whom the Hubble Space Telescope was named. "We would have loved to see it go," said **Harvey Hubbell IV**. "But what is the important thing? The more important thing is not the shot, it's the mission. That's the important thing." Hubble organized the family reunion around the expected launch of Discovery. [Banke, **FLORIDA TODAY**, pp. 1A-2A, April 11, 1990, Halvorson, **FLORIDA TODAY**, p. 6A, April 11, 1990, Hoversten, **USA TODAY**, pp. 1A-2A, April 11, 1990, Lunner, **FLORIDA TODAY**, p. 2A, April 11, 1990, Merzer, **THE MIAMI HERALD**, April 22, 1990, Glisch, **THE ORLANDO SENTINEL**, April 8, 1990, "Hubbles Huddle to Witness Flight of Relative's Namesake," **THE ORLANDO SENTINEL**, April 8, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-14, April 11, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-8, April 12, 1990, "Hubbles Stranded On Way to Launch," **THE ORLANDO SENTINEL**, p. E-1, April 15, 1990, Jackson, **THE ORLANDO SENTINEL**, p. A-14, April 11, 1990, Merzer, **THE MIAMI HERALD**, p. 5A, April 10, 1990.]

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GLOBAL MEDIA AT KSC

European journalists turned out in force - more than 50 - to observe the launch of Discovery and the Hubble Space Telescope. The European Space Agency contributed 15 percent of the \$2 billion cost of the HST. **Serge**

Brunier, a photographer for **SKY AND TELESCOPE** magazine said, "When you come all the way from France to see the Shuttle, you really want to see it. It is the world's premiere telescope. I am excited about space and the Shuttle, but it just seems crazy that it never goes up." **Jean-Paul Croize**, a writer for **LE FIGARO**, "Because we are directly investing in the telescope and in space research, French people are very interested in space. We love to make dreams, and the space telescope will make our dreams. Maybe we will even see God." [Reed, **FLORIDA TODAY**, p. 6A, April 11, 1990.]

April 12: **LAUNCH DATE SET**

NASA set April 25 as the new launch date for Shuttle Discovery's mission to deploy the \$1.5 billion Hubble Space Telescope. A faulty Shuttle Auxiliary Power Unit, which caused the launch abort April 10, will be replaced. The HST's batteries will be removed and recharged in a laboratory. **Pat Phillips**, a spokeswoman for Kennedy Space Center, said, "We think it's going to take seven to eight shifts over the weekend to remove the A.P.U. and replace it with a spare." [Banke, **FLORIDA TODAY**, p. 1A, April 12, 1990, Banke, **FLORIDA TODAY**, p. 1A, April 13, 1990, "Shuttle Launch Date Is Set for April 25," **USA TODAY**, p. 3A, April 13, 1990, Wilford, **THE NEW YORK TIMES**, p. A10, April 13, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-10, April 13, 1990.]

April 13: **DELTA LAUNCH TONIGHT**

McDonnell Douglas's Delta 2 is scheduled for launch tonight from Cape Canaveral Air Force Station between 6:28 and 9:38. The Delta will launch the Palapa B2-R which was originally launched in 1984. Subsequently it malfunctioned and was rescued by the Shuttle in the same year. [Oates, **THE ORLANDO SENTINEL**, p. A-14, April 11, 1990, Oates, **THE ORLANDO SENTINEL**, p. A-10, April 13, 1990, Oates, **THE ORLANDO SENTINEL**, p. A-3, April 14, 1990.]

April 14: **RESISTORS CAUSE NO PROBLEMS**

NASA said that a Federal investigation of a Florida company accused of providing faulty parts for Shuttles will not halt launch plans. "We've used the resistors on the Orbiters over and over again and we have not seen any significant problems," said NASA spokesman **Dwayne Brown**. "Right now, we're not looking at any critical safety issues because if they worked the first time, there's a good high-percentage chance they are going to keep working." NASA Inspector General **Bill Colvin** is investigating **Impala Electronics Co.** (Tampa, FL).

The resistors are used to send correct amounts of current to various Shuttle electrical systems. Each Orbiter uses tens of thousands of resistors from a variety of manufacturers, Brown said. NASA will, however, halt purchases of resistors from Impala Electronics until the investigation is completed. ["Memo: Firm Sold Bad Shuttle Parts," **THE MIAMI HERALD**, p. P7, April 15, 1990, "Allegations of Faulty Shuttle Parts Prompt Inquiry," **THE ORLANDO SENTINEL**, p. A-16, April 15, 1990, Gerth, **THE NEW YORK TIMES**, p. 6, April 14, 1990, Halvorson, **FLORIDA TODAY**, pp. 1A-2A, April 15, 1990.]

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REVIEW BOARD NAMED

NASA has appointed a board to investigate the April 4 accident that occurred while workers were removing a part from Atlantis. **George Abbey**, Deputy Associate Administrator for the Office of Space Flight, will head the six-member board, which will submit its findings by April 30. Workers were preparing to remove a fuel cell that failed a post-flight inspection when the accident occurred. ["NASA Names Review Board," **FLORIDA TODAY**, p. 8E, April 15, 1990.]

April 15:

EXTRA WORK ON DISCOVERY

The necessity to replace a faulty auxiliary power unit on Discovery could affect Columbia's scheduled May 9 launch, said a NASA spokesman today. Columbia is expected to rollout to launch pad 39A on April 22, the date that the countdown for Discovery's launch begins. "Operations like this are elastic. You could pick up time at the front end and lose it on the back end," spokesman **George Diller** said. "The 25th is a very comfortable date. It all fits neatly -for both vehicles. We're down to what the whole program is about -processing parallel vehicles. There's only so much you can do with Columbia when Discovery's on the pad. There's some instances where you've got your crews working on pad B when you need them on pad A." The new APU will be pressurized tomorrow in preparation for its performance evaluation test. Hubble's six nickel-hydrogen batteries, which were removed on April 14, began a 130-hour recharge around noon today. The batteries' charge will hold through launch attempts as late as April 29. [Banke, **FLORIDA TODAY**, p. 7A, April 14, 1990, Higginbotham, **FLORIDA TODAY**, p. 4A, April 16, 1990, "Discovery, Hubble Juiced Up for Launch," **THE ORLANDO SENTINEL**, April 16, 1990, , Wilford, **THE NEW YORK TIMES**, p. A10, April 13, 1990.]

April 16:

COLUMBIA MISSION DELAY

Columbia's launch has been impacted by the delay in launching Discovery's Hubble Space Telescope Mission. NASA officials said today that Columbia won't fly until mid-May. "We're not going to be able to make the ninth, but we still don't have a clear target yet," said Kennedy Space Center spokeswoman **Lisa Malone**. She went on to say that Shuttle Program Managers wanted at least three weeks to study Discovery's launch data and hardware before launching Columbia. Meanwhile work continued on launch preparations for Discovery. [Halvorson, **FLORIDA TODAY**, p. 1A, April 17, 1990.]

April 17:

DISCOVERY LAUNCH SCHEDULE

"We're running ahead of schedule in replacing and testing the auxiliary power unit and recharging the Hubble Space Telescope's batteries. If things continue to go well, there will be a poll of top Shuttle Managers" today, according to **Lisa Malone**, Kennedy Space Center spokeswoman. If the replacement auxiliary power unit passes a crucial test April 18, NASA may move up the launch of Discovery by one day. [Halvorson, **FLORIDA TODAY**, p. 4A, April 18, 1990.]

April 18:

LAUNCH DATE MOVED UP

Discovery will be ready for a second launch attempt April 24, a day ahead of the previously announced schedule. "Everyone believes we're now ready to fly, and all of us will be looking forward to the data the Hubble Space Telescope will produce as it begins its exploration of the universe," said **Robert Crippen**, Shuttle Program Director.

Technicians this week will test electrical and mechanical connections between Columbia and its solid rocket boosters, external tank and mobile launch platform in the Vehicle Assembly Building. This two-day test must be completed before Columbia can be rolled out to Launch Pad 39A. [Glisch, **THE ORLANDO SENTINEL**, April 19, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A8, April 21, 1990, Halvorson, **FLORIDA TODAY**, p. 1A, April 19, 1990.]

April 19:

HST BATTERIES INSTALLATION

Late today the Hubble Space Telescope's batteries were installed in the telescope; they had been removed for recharging after the April 10 launch attempt was scrubbed. The batteries will be tested April 14. Technicians also finished installing explosive devices on Discovery's solid rocket

boosters and external tanks. Storage tanks were filled as well. [Halvorson and Banke, **FLORIDA TODAY**, p. 3A, April 20, 1990.]

April 21:

BRYAN ON STANDARDS PANEL

Coleman J. Bryan, NASA's Materials Manager at Kennedy Space Center, was elected recently as Chairman of the American Society For Testing and Materials' Committee on Compatibility and Sensitivity of Materials in Oxygen-Induced Atmospheres. Bryan, resident of Merritt Island, FL, has worked at Kennedy Space Center since 1968. He will serve a two-year term on the panel. ["NASA Manager Gets Panel Post," **THE ORLANDO SENTINEL**, p. E-5, April 22, 1990.]

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SPACE TOOLS SHOW

EG&G Florida plans to exhibit tools of the space trade and hold several live demonstrations of the tools' use at the 27th annual Space Congress (Cocoa Beach, FL). As Base Operations Contractor for Kennedy Space Center, EG&G provides fire, rescue, security and other services. ["EG&G To Demonstrate Tools of Space Trade," **THE ORLANDO SENTINEL**, p. E-5, April 22, 1990.]

April 22:

WEATHER CONCERNS FOR LAUNCH

Rainy weather expected to move into Central Florida today may delay final preparations for **Discovery's** launch on the 25th. "Hopefully, we'll get the Shuttle off the pad this time," said **Mike Leinbach**, NASA Test Director. He added that there are no technical issues which threaten the liftoff, planned for between 8:31 a.m. and 2:43 p.m. Weather forecasters predicted a 70 percent chance for launch on the 25th.

Discovery's crew arrived this afternoon in their T-38 jets. "Columbia looks very good out there," said **Discovery Commander Loren Shriver**. NASA has not had two Shuttles on the pad since **Challenger** and **Columbia** were on pads in January 1986. As **Columbia** rode out to the pad, its crawler transporter passed its 1,000th mile and a brief ceremony was held to mark the milestone. [Brown, **FLORIDA TODAY**, p. 1A, April 23, 1990.]

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SPACE CONGRESS LAUNCHES

The opening of the 27th Space Congress may coincide with the launch of **Discovery** and the **Hubble Space Telescope**. Congress Event Chairman **Doug Sargent** joked, "We spared no expense." Sargent is head of **Lockheed Space Operations Co.** (Titusville, FL). This year's theme is "The

90s - Decade of Opportunity." Sargent said, "We deliberately selected that theme as opposed to 'challenge' or various other themes that might indicate tough going. We really do believe that in the 1990s, with the increased outward look into space, it will be a decade of opportunities." [Banke, *FLORIDA TODAY*, p. 1A, April 22, 1990, Banke, *FLORIDA TODAY*, p. 8E, April 22, 1990, "Space Congress Opens In Cocoa Beach," *FLORIDA TODAY*, p. 4A, April 24, 1990, Caporale, *THE ORLANDO SENTINEL*, pp. E-1 & E-2, April 22, 1990, Minor, *THE ORLANDO SENTINEL*, p. A-1, April 22, 1990, Minor, *THE ORLANDO SENTINEL*, pp. E-1 & E-5, April 22, 1990.]

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CONGRESS PURPOSE

"For more than 25 years, the Canaveral Council of Technical Societies, with the support of the National Aeronautics and Space Administration and the Department of Defense, has sponsored and conducted the Space Congress. The event is held in Cocoa Beach, just south of the Kennedy Space Center and the Cape Canaveral Air Force Station, the nation's principle launch facilities. The Congress features authoritative presentations on the technical activities and accomplishments of a broad spectrum of space programs. The information presented covers recent space missions and experiments, details the status [of] development programs, and outlines the future direction of the program. A comprehensive proceedings of the technical presentations is published.

By sponsoring the Space Congress, the member societies of the CCTS hope to stimulate interest and promote professionalism in the space program. Key managers and technical specialists from all segments of the aerospace community will attend. The Congress provides a forum where space professionals meet to broaden their knowledge of key technical areas and to discuss pertinent issues facing the space program.

The Congress features public exhibits where the leading aerospace companies can display the latest technologies. Local students are involved in a science fair exhibit and competition. An open session is held for the public to meet the Shuttle Astronauts and Mission Specialists.

Recent Space Congresses have been four days in length. The popularity of the technical panel sessions has led to a featured panel on each of the mornings of the Congress. The topics of these panels typically are Shuttle Systems Update, Department of Defense Activities, Expendable Vehicles and Payloads, Shuttle Payloads, Commercial Opportunities in Space, and Future Systems and Missions.

Paper sessions featuring more technical detail are held each afternoon, and cover topics such as Technology Applications, Ground Operations, Satellite Communications, Energy, Environment, International Space Missions, Materials and Mechanisms, Computers in Aerospace and other topics chosen to fill out the general theme or to coincide with current interest. An evening panel session, open to the public, presents Astronauts, Payload Specialists, and Program Managers.

Exhibits are open to the public, as is the science fair. Keynote, luncheon and banquet speakers feature informative and often provocative perspectives. The Missile, Space and Range Pioneers hold a banquet during Space Congress week and provide an entertaining and informative speaker associated with aerospace programs.

Participation in the technical program is generally by invitation of the Space Congress committee or panel session chairman. Offered papers are considered along with invited papers. The aerospace community was issued a call for papers late last year. Technical or educational displays are encouraged. Exhibit space is provided. Exhibitors are not allowed to sell items.

The CCTS consists of 28 technical and professional societies. It was founded in 1960 and incorporated formally in 1965. It covers six counties on the east coast of Florida near Cape Canaveral. Council bylaws contain three objectives that encourage Space Congress sponsorship: 1. Encourage public interest and participation in technical and professional matters; 2. Bring together members of the technical, scientific, engineering and professional organizations for cooperative effort in increasing the scope and availability of technical information and services, and 3. Promote and support the activities of technical, scientific and professional stature of the member societies.

In October 1962, with the support of the fledgling CCTS, the first Space Congress was held at Daytona Beach. Beginning in 1964, the annual meetings have been held in Cocoa Beach during the last week of April.

Each Space Congress operates independently under the general cognizance of CCTS, whose chairman and vice chairman serve as the principal advisor and the finance chairman of the Space Congress Committee. The Committee is headed by a general chairman selected by CCTS. The general chairman is selected from among leaders in the local aerospace community, according to recent technical accomplishments and leadership attributes. This chairman is in charge of the Congress and selects individuals to fill the fifteen or more key positions on each year's Congress

Committee." ["Space Congress Statement of Purpose," THE ORLANDO SENTINEL, p. E-6, April 22, 1990.]

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CREW ARRIVAL TODAY

Discovery Commander Loren Shriver, Pilot Charles Bolden and Mission Specialists Kathryn Sullivan, Steven Hawley and Bruce McCandless are expected to arrive at Kennedy Space Center today about 1 p.m. Workers today will also move Columbia out to Launch Pad 39A for its scheduled May 16 launch. On the rollout, the Shuttle's crawler transporter will pass the 1,000-mile mark and a special ceremony will mark the event. [Banke, FLORIDA TODAY, p. 1A, April 22, 1990.]

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IVEY CONSTRUCTION CONTRACT

Kennedy Space Center hired Ivey Construction Inc. (Merritt Island, FL) to modify parts of an existing warehouse for a space station storage area. Under the \$186,275 contract, the firm will have 210 days to put up walls and install air handling equipment inside the 30,000-square-foot warehouse. The first dedicated Space Station Shuttle flight is scheduled for 1995 and the Space Center will be responsible for preparing Space Station elements for launch. ["Building Modifications Begin," FLORIDA TODAY, p. 8E, April 22, 1990.]

April 23:

DISCOVERY READY, AGAIN

Discovery was declared ready for flight today after a two-week delay costing more than \$500,000. "We're ready to fly," said Dr. Lennard A. Fisk, Associate Administrator for Science at the National Aeronautics and Space Administration. The delay occurred because a new power unit had to be installed in the Orbiter. During the postponement, the six batteries of the Hubble Space Telescope had to be removed and recharged. William E. Taylor, Hubble Engineering Manager at the Marshall Space Flight Center (Huntsville, AL), said that the maintenance work had caused no apparent contamination to the telescope. "Hubble has maintained its high state of cleanliness. We have seen nothing that gives us any cause for concern," said Taylor. [Halvorson, FLORIDA TODAY, pp. 1A-2A, April 24, 1990, Merzer, THE MIAMI HERALD, p. 4A, April 24, 1990, Wilford, THE NEW YORK TIMES, p. C6, April 17, 1990.]

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MODEL SPACEPLANE AT SPACEPORT

A replica of the "Orient Express" the National Aerospace Plane will be permanently based at Spaceport USA. The mock-up, which arrived at

Cape Canaveral Air Force Station today aboard an Air Force C-5A cargo plane, has been displayed at both the Paris Air Show, the Dayton International Air Show in Ohio, and, most recently, at the Naval Air Show this past weekend in Norfolk, VA. Despite being based at the Spaceport, the spaceplane will be made available to air shows across the country. [Halvorson, **FLORIDA TODAY**, p. 4A, April 24, 1990.]

April 24:

DISCOVERY LAUNCHES HST MISSION

Discovery reached an altitude of 381 miles above the earth - the highest ever for a Shuttle - after its launch today at 8:34 a.m. NASA Administrator Richard H. Truly said of Discovery and its HST payload, "It's in its element now. The first step is always the hardest. And we're beyond that now." Dr. Edward J. Weiler, Chief Hubble Scientist for NASA, said, "The few seconds of thrill made the 12 years of effort well worth it."

Shuttle Commander Loren Shriver, noting Hubble is planned to operate into the next century, said of the mission: "It should be, and is, a source of national pride for the country. I might be able to tell my grandkids some day, 'Yeah, it's still up there and is still sending back some data and your old granddad actually had something to do with that.'" [Banke, **FLORIDA TODAY**, pp. 1A-2A, April 25, 1990, Merzer, **THE MIAMI HERALD**, pp. 1A & 6A, April 25, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-8, April 25, 1990, Shanklin, **THE ORLANDO SENTINEL**, p. A-8, April 25, 1990, Hoversten, **USA TODAY**, pp. 1A-2A, April 25, 1990, Wilford, **THE NEW YORK TIMES**, p. 1A, April 25, 1990.]

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DELAY REDUCED PRESS CREW

The number of media representatives at Kennedy Space Center dropped to one-third the 620 journalists who showed up for the April 10 launch attempt. "It's a little disappointing that so few European journalists are here. They are really missing the dimension of the event," said Frederic Castel, a French writer based in Miami for Agence France Presse. One reason for the smaller foreign press contingent for the second attempt is that fewer European corporations footed journalists' travel expenses for a second effort. [Reed, **FLORIDA TODAY**, p. 10A, April 25, 1990.]

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KSC EXHIBIT

A new public exhibit at Kennedy Space Center uses satellite surveillance photographs is helping to pinpoint problems with the Indian River Lagoon. The exhibit shows space vehicles and the images they take of the amount

of underwater grasses in the lagoon, which are critical to a wide array of fish life. [Jones, **FLORIDA TODAY**, p. 2B, April 25, 1990.]

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THOMPSON'S SPACE CONGRESS SPEECH

NASA's Deputy Administrator **J. R. Thompson** told the 27th Space Congress how he envisioned the space program in the year 2000. He foresaw a Shuttle fleet of five, with two more on order and said that by the end of the century, NASA would have completed 129 Shuttle flights and would be preparing to deliver third-generation instruments to the Hubble Space Telescope. Thompson went on to say that by 2000, the National Aerospace Plane will be built and about to begin tests flights and that the first flight to a permanent scientific base on the moon would be just a few years away. "Let's not make technology alone the end product," Thompson said. "To go, to explore and to safely return is the mission and it is that on which we will be judged." He went on to say that NASA's 15% budget increase requested this year is by no means assured, but "how we end up in Congress will go a long way toward setting the tone of this decade." [Brown, **FLORIDA TODAY**, p. 10A, April 25, 1990, Oates, **THE ORLANDO SENTINEL**, pp. E-1 & E-3, April 22, 1990.]

April 26:

COLUMBIA CREW ARRIVES

Columbia's seven-member crew arrived at Kennedy Space Center today for a weekend practice countdown. Crew member **Samuel Durrance** remained in Houston due to an undisclosed illness. The practice countdown begins at 8 a.m. April 27 and concludes at 11 a.m. April 28. The other six members of Columbia's crew include: Commander **Vance Brand**, Pilot **Guy Gardner**, Payload Specialist **Ronald Parise**, and Mission Specialists **John "Mike" Lounge**, **Jeffrey Hoffman** and **Robert Parker**. [Banke, **FLORIDA TODAY**, p. 10A, April 27, 1990, Higginbotham, **FLORIDA TODAY**, p. 4A, April 28, 1990.]

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ASTRONAUTS SPEAK TO STUDENTS

Astronauts **Michael McCulley**, **Mario Runco, Jr.** and **Norman Thagard** spoke to students and space enthusiasts at the 27th annual Space Congress in Cocoa Beach, FL. Thagard told the audience which included science fair winners, "In this country, perhaps we haven't done as good a job educating students, but you all are doing the right thing." Astronaut **Mario Runco** told the audience that he had to apply five times before NASA accepted him as an astronaut, "Stick to that dream and don't lose sight of it because it is attainable." [Brown, **FLORIDA TODAY**, p. 10A, April 27, 1990.]

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HONEYCUTT AT SPACE CONGRESS

"We've got to maintain the capabilities that we have. But in order to support the Space Station Freedom Program, we've got to develop the capability to get more payload to orbit," said Kennedy Space Center's **Jay Honeycutt** speaking to the 27th annual Space Congress at Cocoa Beach, FL. Honeycutt is Director of Shuttle Management and Operations at KSC. He went on to say that the Shuttle flight rate can be picked up safely by streamlining processing and trimming voluminous paperwork.

Johnson Space Center's Assistant Director for Space Shuttle Programs, **Tommy Holloway**, said, "Getting ready to fly a Space Shuttle today takes too long, is too complex and does not offer the flexibility we need to meet future needs." He said that Shuttle missions take as long as two years to plan, train for and execute and that upgrading computer hardware and software at JSC will reduce the total preparation time required. [Banke, **FLORIDA TODAY**, p. 10A, April 27, 1990.]

April 28:

COLUMBIA CREW PRACTICES

"Overall it was a good exercise with a few curves thrown in," said Kennedy Space Center spokesman **George Diller** about Columbia's crew practice today. Upper level winds were blowing in a manner the Space Shuttle's computers were not programmed for, so Launch Director **Bob Sieck** ordered the computer program updated while the clock held at nine minutes before launch. That process delayed the simulated liftoff 24 minutes to 11:24 a.m. Diller said that this was the first time that procedure was attempted. Computers cut off the rehearsal five seconds before launch. [Banke, **FLORIDA TODAY**, p. 2A, April 29, 1990.]

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PACE WINS CONTRACT

Pace Constructor's Inc. (Oviedo, FL) has been awarded a \$428,605 contract to replace hot water heating pipes, chilled water lines and boilers at several facilities at Kennedy Space Center. Most of the work involves replacing underground lines at road crossings, but some new above-ground installations will be made as well. ["Pace Will Repair Pipes at KSC," **FLORIDA TODAY**, p. 8E, April 29, 1990.]

April 29:

DISCOVERY LANDS

After a steep descent, Discovery landed at 9:49 p.m. at Edwards Air Force Base, CA. High winds had threatened to postpone the landing. "Congratulations on a super mission. The world is looking forward to

reaping the benefits of your good work for the next 15 years," astronaut **Stephen Oswald** said from Mission Control (Houston, TX). The astronauts emerged from Discovery 50 minutes after landing.

Associate Administrator **William Lenoir** said that apparently the Orbiter's new brakes had worked well; they were removed for further inspection. The new carbon brakes were designed to last for 50 landings; the older brakes were designed for six landings. The new brakes are a precondition to resuming landings at Kennedy Space Center. Landings at KSC would save NASA about \$1 million per mission and week's worth of processing time. [Brown, **FLORIDA TODAY**, pp. 1A-2A, April 30, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-8, April 29, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-4, April 30, 1990, "Shuttle Lands; Hubble May Not Work 100%," **THE MIAMI HERALD**, p. 3A, April 30, 1990.]

April 30:

DISCOVERY RETURN DELAYED

High winds continued to delay until the weekend the return to Kennedy Space Center of Discovery from Edwards Air Force Base (CA). The Shuttle landed April 29 in excellent condition following its Hubble Space Telescope mission. The Orbiter's Processing Manager, **John "Tip" Talone** said, "It looks much better than average. In all, it was an excellent flight and puts us in a good position for Ulysses."

Preliminary inspections of Discovery showed that five heat-resistant tiles needed to be replaced and 33 needed repair. Talone, referring to Discovery's new brakes, said "There was no sign of any damage." Technicians plan to remove an Orbiter steering motor that failed during the flight and send it to Kennedy Space Center for laboratory analysis. [Lunner, **FLORIDA TODAY**, p. 1A, April 29, 1990, Brown, **FLORIDA TODAY**, p. 4A, May 1, 1990.]

MAY

May 1: AS-204 CAPSULE RETURN

NASA will bury the spacecraft in which three astronauts died January 27, 1967 in one of two abandoned Minuteman missile silos which also holds debris from the Challenger accident. "It seems like this is the most reasonable place to put it since we have the other debris from the Challenger accident there," said NASA spokesman **Mark Hess**.

The Apollo capsule is being moved for two reasons: The container the craft was stored in is leaking and deteriorating. Secondly, there is no longer enough space available in the warehouse where the module has been stored. The silos where the debris will be buried are about five miles from Launch Complex 34, where **Gus Grissom**, **Roger Chaffee** and **Edward White** were killed in the capsule fire. [Halvorson, **FLORIDA TODAY**, p. 1A, May 2, 1990, "Apollo 204 Remains to Join Challenger Debris in Florida," **SPACE NEWS ROUNDUP**, pp. 1 & 4, May 4, 1990, "Apollo Remnants to Join Shuttle In Space Tomb," **THE MIAMI HERALD**, p. 6A, May 9, 1990, "Apollo Debris To Be Moved To Canaveral," **THE ORLANDO SENTINEL**, May 2, 1990.]

May 2: COLUMBIA: LAUNCH PAD WORK

Extra work at the launch pad may require Columbia's liftoff to slip a day. Several unscheduled activities today delayed other tasks. Technicians replaced a quarter-inch line in Columbia's main propulsion system; the old line leaked during a test last weekend. Workers vacuumed small pieces of debris from a liquid hydrogen line on Columbia's mobile launch platform; the debris was discovered after Columbia's January launch. [Halvorson, **FLORIDA TODAY**, p. 9A, May 3, 1990.]

May 7: DISCOVERY RETURNS TO KSC

Discovery returned this morning to Kennedy Space Center eight days after landing at Edwards Air Force Base, CA. Heavy thunderstorms forced overnight stays at Air Force bases in Texas and Georgia. Discovery will be demated from its carrier plane and towed to the Orbiter Processing Facility by the morning of May 8.

NASA spokesman **George Diller** said that preparations for Columbia's next mission are on target. The Flight Readiness Review for the mission will also be held at KSC May 8. [Higginbotham, **FLORIDA TODAY**, p. 1A, May 7, 1990, Banke, **FLORIDA TODAY**, p. 1A, May 8, 1990.]

May 8:

COLUMBIA: POSSIBLE DELAY

A problem with Columbia's cooling system may delay the Shuttle's launch for days or weeks. Administrator **Richard Truly** described the problem as not serious but time-consuming and difficult to repair. The cooling system problem will be discussed by Shuttle Managers May 9 during the Flight Readiness Review.

On May 6, engineers saw an unexplained change in the flow of freon through one of the Orbiter's two cooling loops, which keep the astronauts and the vehicle cool during flights. Managers face several options:

- *Fly as is and hope it works without trouble; an early landing at Edwards Air Force Base is required by NASA rules should there be trouble in-flight.

- *Repair the problem on the launch pad; the procedure has never been done on the pad and depends upon whether the unit in question can be reached. A repair would take about a week.

- *Roll Columbia back to the Vehicle Assembly Building for destacking and repair with the Shuttle in a horizontal position.

NASA Associate Administrator for Space Flight **William Lenoir** said, "We're not going to launch unless we're convinced we have two healthy freon loops that we understand, and that - to the best of our ability to project ahead - both are going to last the entire scheduled mission." Columbia had a similar problem during its August flight, when a valve in the second loop of the cooling system became clogged. In that instance, the valve was replaced. [Halvorson, **FLORIDA TODAY**, p. 4A, May 4, 1990, Banke, **FLORIDA TODAY**, pp. 1A-2A, May 9, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-11, May 9, 1990.]

May 9:

2-3 WEEK DELAY

The launch of Columbia has been officially delayed for two to three weeks, NASA said today. "We are obviously disappointed that we are not ready to fly. However, this particular system is absolutely critical to the safety of the crew and overall mission success, so we have decided to change the component," said **William Lenoir**, Associate Administrator for Space Flight. **Bascom Murrah**, Manager of Prelaunching Operations for the Columbia missions, said, "They don't understand the problem enough to feel comfortable flying with it, so they've got to go in and fix it. We feel we can do that at the pad, but how long that will take I really would only be guessing."

The problem: A valve that controls the amount of freon flowing between the cargo bay and the crew compartment is not working normally. Engineers noticed the malfunction Sunday. To reach the valve, workers must remove the lining of the payload bay floor, an equipment storage container and a piece of structural equipment. They will drain the freon, replace and valve and service the cooling system. This delay could also postpone Columbia's scheduled August mission.

"We don't know what, if any, the impact will be to the remainder of the manifest. We're looking at it, but it is not a given that we'll lose any flights either with this vehicle or the others," Launch Director Robert Sieck said.

There are other problems with the Orbiter: The plate that connects the ground supply of liquid oxygen to the Shuttle's rear engine compartment must be repaired because a bolt was sheared off when the plate was aligned. The Orbiter's hydraulic lines must be serviced because a leak has allowed air into the system. [Banke, **FLORIDA TODAY**, p. 1A, May 10, 1990, "Faulty Valve Delays Launching of Shuttle," **THE NEW YORK TIMES**, p. A17, May 10, 1990, Halvorson, **FLORIDA TODAY**, p. 4A, May 12, 1990, "Coolant Repair Postpones Columbia's Astro-1 Mission," **MARSHALL STAR**, p. 1, May 16, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-10, May 10, 1990.]

May 11:

HALL OF FAME DEDICATED

Five of the six living Mercury astronauts attended the dedication of the U. S. Astronaut Hall of Fame and U. S. Space Camp Florida. Those present were U. S. Sen. John Glenn, Alan Shepard, Scott Carpenter, Gordon Cooper and Donald 'Deke' Slayton; Walter Schirra was unable to attend because of a previous engagement.

The astronauts, in their remarks, focused on the future of space flight and exploration: "None of us need the memorial. We don't need an exhibit. We all have the Mercury days so firmly, indelibly imprinted on our minds and our memories. We can just close our eyes and almost sense what it was like back in those days," said Senator John Glenn, the first American astronaut to orbit the Earth. "But if this can help inspire someone to get a better education and inspire some of our young people to do some research, then this will all be worthwhile." The hall is open from 8 a.m. to dusk daily. Admission is \$4.95 for adults and \$2.95 for children 3 to 12. [Halvorson, **FLORIDA TODAY**, pp. 1A-2A, May 12, 1990, Minor, **THE ORLANDO SENTINEL**, p. A-8, May 12, 1990.]

May 12:

AWARD WINNING COMPUTER TEAM

A Shuttle Processing Contract Award was given to a Kennedy Space Center workers for its upgrade of a complete computer network in just four days. The Lockheed Space Operations Co. team upgraded 20 computer work stations which support the processing of the Shuttle fleet. The 20 computers were located in the Vehicle Assembly Building, the Orbiter Processing Facility and firing rooms in the Launch Control Center and other space center buildings. **Jim Entinger**, Lockheed's Launch Processing System Hardware Engineering Manager, said, "It was done so smoothly and so professionally that nobody would have known what happened except for the sizeable increase in capability the new computers provided." The team members are: **Debra Miller, George Jenkins, Jim Ayers, Kerry Barney, John Poole, Merrilu Prange, Carl Zelich, Jay Blaikie, Kevin Ryniewicz, and Richard Beck.** ["Computer Team's Fast Work Noted," **FLORIDA TODAY**, p. 7E, May 13, 1990.]

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MCDONNELL DOUGLAS AWARD WINNERS

The 1989 winners of McDonnell Douglas's General Manager's Award include **Matthaus Atkinson, Laurie McManus, Douglas Lauts, Calvin Cooley, Jeffrey Rainey, Steven Walden, Sally Jones, James McMillan, Joseph Van Riper, and John Yohn.** The awards were announced in ten separate presentations by **George Faenza**, Vice President and General Manager for McDonnell Douglas's Kennedy Space Center division. [McDonnell Douglas Names 10 Winners," **FLORIDA TODAY**, p. 7E, May 13, 1990.]

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HEWLETT-PACKARD WINS CONTRACT

Hewlett-Packard Co. has been awarded a \$730,113 contract to provide computer hardware at Kennedy Space Center over a 90-day period. The equipment will make up the Combinational Board Test System. The system will be used to evaluate the quality and performance of electronic circuit boards purchased under government contract for use in Shuttle ground-support equipment. ["Firm Wins KSC Contract," **FLORIDA TODAY**, p. 7E, May 13, 1990.]

May 13:

COLUMBIA: WORK CONTINUES

Repair on Columbia's faulty cooling system continued today with Kennedy Space Center technicians preparing to remove and replace a valve that is malfunctioning, according to **Dick Young**, KSC spokesman. Today, workers drained freon from the cooling system, a task that was begun

yesterday. The work should be completed May 14. Once the fluid is removed, the 36-hour valve replacement can take place. NASA managers are expected to announce a new launch date as soon as the cooling system repairs are completed. ["Work Continues On Columbia's Cooling System," **FLORIDA TODAY**, p. 4A, May 14, 1990.]

May 15:

NASA: PAY FOR RESCUE

NASA has agreed to develop a mission to rescue a stranded INTELSAT if its owner will pay the cost of the mission. "We've agreed it's doable. Now it's going to be up to INTELSAT to see if they want to pay the cost to do whatever we have to do to save the spacecraft," said NASA spokesman **Dave Garrett**. INTELSAT spokesman **Tony Trujillo** said, "Our board of governors will decide what to do about the Shuttle mission, whether to go forward with it or not." NASA said a rescue mission could be launched in late 1991 or 1992 and might cost between \$100 and \$150 million. The mission itself would involve a spacewalk to attach a special motor to propel the satellite from its present location of 345 miles above Earth to geosynchronous orbit at 22,300 miles above Earth. [Halvorson, **FLORIDA TODAY**, p. 1A, April 16, 1990, "NASA Might Rescue Satellite," **THE NEW YORK TIMES**, p. C19, May 17, 1990, "NASA Will Save Satellite - For A Price," **THE ORLANDO SENTINEL**, p. D-1, May 16, 1990.]

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BROKEN FILTER CAUSED DELAY

A filter the size of a thimble came apart inside a cooling system valve aboard Columbia and caused a two to three-week delay in the Shuttle's launch. Today technicians found a piece of the filter in a T-shaped valve that controls the flow of freon between the Orbiter's cargo bay and crew module. The valve and accompanying parts were sent to Rockwell International's Shuttle spare parts service center (Titusville, FL) to learn why the part failed according to **Lisa Malone**, Kennedy Space Center spokeswoman.

When more inspections have been performed, officials expect to know whether the filter was the system's only flaw. Two other filters used in the part appear undamaged. "We need to complete the repair work and associated operations before it is possible to target a new launch date," **Malone** said. Tomorrow, technicians will begin welding a new valve assembly into place. After this three-day job is completed, X-Ray inspections will check for leaks and the system will be refilled with freon. Routine pre-launch preparations could begin this weekend. [Banke, **FLORIDA TODAY**, p. 6A, April 16, 1990.]

May 16:

APOLLO CAPSULE DESTINATION

The charred Apollo 1 capsule may be given to the Smithsonian Institution's National Air and Space Museum; the capsule was to have been buried along with 81 cartons of hardware and investigation data from the Apollo 204 fire in two silos housing Challenger debris at Cape Canaveral Air Force Station. **John Lawrence**, Chief of Congressional Affairs for NASA's Office of Space Flight in Washington, said that the Smithsonian would "pull together their committee of administrators and curators to think once again whether they want to [accept the hardware]."

Smithsonian officials, who turned down a chance to take the materials in five years ago, will have to weigh any restrictions NASA imposes on displaying the Apollo module, according to **Lin Ezell**, Assistant Director for Collections Management and member of the committee which will decide whether to accept the materials. The materials were supposed to have been moved to Florida starting this weekend, but such a shipment will now await the museum's decision. [Banke, **FLORIDA TODAY**, p. 4A, May 17, 1990.]

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COLUMBIA: COOLING VALVE TEST

Today technicians will test Columbia's new cooling system valve at Launch Pad 39A. The cooling system will be replenished with freon either May 17 or 18 and that will conclude the week-long repair effort, according to **Bruce Buckingham**, Kennedy Space Center spokesman. Tomorrow technicians will also pump liquid argon into one of the telescopes in Columbia's payload bay. The argon cools the X-Ray telescope's instruments so they can operate properly in space. [Halvorson, **FLORIDA TODAY**, p. 4A, May 17, 1990, "Valve Removed From Columbia," **THE ORLANDO SENTINEL**, p. A-3, May 16, 1990.]

May 17:

FUTURE MISSION PREPARATIONS

The Ulysses planetary probe, which is expected to be launched October 5 aboard Discovery, will arrive at Kennedy Space Center today between 8 and 9:30 a.m. aboard an Air France plane. The European Space Agency satellite will study the polar regions of the sun. The spacecraft will spend this week in the Hangar AO Planetary Spacecraft Check-out Facility.

The ROSAT scientific satellite, built in Germany, will be moved today from a KSC spacecraft servicing facility to Launch Complex 17A, where it will be placed atop the Delta rocket which will send it into space May 31.

ROSAT's mission is to perform the first survey of celestial objects that emit X-Rays. [Halvorson, **FLORIDA TODAY**, p. 4A, May 17, 1990.]

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COLUMBIA: TARGET DATE SET

Columbia's launch is now targeted for May 30. "We've got enough work to keep us busy until the 30th, but we think we can make it," said Kennedy Space Center spokesman **Bruce Buckingham**. A new valve has been installed in Columbia and technicians today soldered lines connected to the new valve. The next step, tomorrow, is to dry the system and to test the cooling system for leaks. [Glisch, **THE ORLANDO SENTINEL**, P. A-3, May 18, 1990, Halvorson, **FLORIDA TODAY**, p. 1A, May 18, 1990.]

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SMITHSONIAN WON'T DISPLAY CAPSULE

"They're not asking to display it. They're interested in storing it," NASA spokesman **Bill Sheehan** said of the Apollo 1 capsule which has been offered to the National Air & Space Museum. Smithsonian officials have expressed interest in obtaining some of the Apollo artifacts for historical purposes. Last week a Kansas museum sent a letter also requesting to store the capsule.

"NASA is still thinking over what it wants to do with it," said **Martin Harwit**, Director of the Air & Space Museum. "We're not sure exactly what is involved in taking it - how much material would have to come along with it and what the costs to preserve it will be." Harwit also said that it was not unusual for a museum to accept donations with the precondition the material not be displayed for a period of time. "It was a tragedy and there are family members who would be hurt by a public display. That has to be handled with sensitivity." A decision on the disposition of the Apollo capsule and other material is expected later this month. The materials have been stored for 23 years at NASA's Langley Research Center (Hampton, VA). ["Charred Apollo Capsule Offered to Smithsonian," **THE ORLANDO SENTINEL**, p. A-3, May 18, 1990, Brown, **FLORIDA TODAY**, p. 4A, May 18, 1990.]

May 18:

HOLIDAY BOOSTS COLUMBIA COSTS

The launch of Columbia, with its countdown coming over the Memorial Day weekend, will cost up to \$500,000 extra. "We're looking at a figure between \$250,000 and \$500,000," said NASA spokesman **Bruce Buckingham**. "It probably will be toward the lower end of that range, but those are the rough figures." The repair to Columbia's cooling system will cost about \$50,000 in emergency landing site team expenses.

Today, technicians tested the cooling system and a replacement valve for leaks. Over the next two days, gaseous nitrogen will be pumped through the system to dry up residual moisture. Then the system will take on 29 gallons of freon.

Countdown for the launch begins May 26. "I'm sure most everybody on the launch team would prefer to have the holiday free, but the job has to be done and everybody is ready to support whatever the NASA management wants," said **Karl Kristofferson**, a NASA spokesman. Launch is now set for between 12:38 and 3:17 a.m. on May 30. [Halvorson, **FLORIDA TODAY**, p. 4A, May 19, 1990.]

May 19: **VAB CONTRACT AWARDED**

Ivey's Construction Inc. (Merritt Island, FL) has been awarded a \$171,347 contract by Kennedy Space Center to renovate the restrooms in the Vehicle Assembly Building. The contract calls for the work to be completed in 220 days. ["KSC Awards \$171,347 Contract," **FLORIDA TODAY**, p. 8E, May 20, 1990.]

□ **CENTRAL INSTRUMENTATION FACILITY CONTRACT**

Steith Construction Inc. (Lakeland, FL) has been awarded a Kennedy Space Center contract worth \$525,000 for roofing work at the center's Central Instrumentation Facility. The fixed-price contract requires the work to be completed within 210 days. The Facility, formerly a spacecraft communications center, now houses administrative offices and computer systems not related to Space Shuttle launch-processing activities. ["Lakeland Company Lands Project," **FLORIDA TODAY**, p. 8E, May 20, 1990.]

May 21: **FREON LOADED TODAY**

Technicians at Kennedy Space Center today will finish refilling Columbia's cooling system with freon. A test of the system, which the cools the Shuttle and its crew quarters, will follow the refilling. "The feeling is we've got a good shot at launching the 30th," remarked **Lisa Malone**, NASA spokeswoman. NASA managers meet at the Space Center today to determine whether May 30 will remain the launch day. [Halvorson, **FLORIDA TODAY**, p. 5A, May 22, 1990.]

May 22:

KSC: NO MAGNET SCHOOL

Kennedy Space Center's Public Affairs Director **Chuck Hollinshead** told Florida legislators today that security concerns and a lack of recreational and other extracurricular activities for students worked against KSC as a site for Florida's first residential math and science high school. An alternative site for the magnet school is at Cocoa Beach High School.

State Representative **Charlie Roberts** (D-Titusville, FL) said he wanted a site closer to KSC to take advantage of the opportunities there. As reported in today's **FLORIDA TODAY**, one option is to build a dormitory in Titusville and drive students to classrooms at an education center planned by the Astronauts Memorial Foundation on space center property.

Local legislators want to involve Kennedy Space Center in the project because it provides a justification for putting the magnet school in Brevard County. Assistant Commissioner of Education **Laurey Stryker** said her agency would be willing to bypass a selection process and put the school in Brevard if KSC were involved. "What kind of exemplary resource could match the Kennedy Space Center?" she asked. "We're looking at a partnership with business and NASA because otherwise we would never be able to afford a math and science school. Hollinshead said NASA would support the project regardless of where the school is located. [Willmore, **FLORIDA TODAY**, pp. 1A-2A, May 23, 1990.]

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ATLANTIS ACCIDENT REPORT

A NASA Accident Investigation Board determined that an April 1990 accident which damaged the three fuel cells on Atlantis was caused by a lack of training and failure to follow specific procedures. The cell was damaged as technicians and inspectors prepared to remove the cell for shipment back to its manufacturer because of problems which emerged during post-flight inspections. **Karl Kristofferson**, NASA spokesman, said, "It had to be replaced anyway because it had a short-circuit in it." The investigation board was headed by **George Abbey**, Deputy Associate Administrator for Space Flight. The board recommended that: supervisors monitoring fuel cell removal operations be on hand when such operations are proceeding and that engineers walk through the procedures to be followed by technicians and inspectors prior to removing the fuel cell. [Halvorson, **FLORIDA TODAY**, p. 9A, May 23, 1990.]

May 23: COLUMBIA'S TEST NEARLY COMPLETE

The final testing of Columbia's repaired cooling system will be completed today. NASA spokesman **Bruce Buckingham** said yesterday, "We hope to have everything finished up Wednesday afternoon. Launching on the 30th still looks good. The schedules fit and we're marching on toward that end." Meanwhile, NASA managers meet in a Flight Readiness Review at Kennedy Space Center on May 24 and May 25. [Halvorson, **FLORIDA TODAY**, p. 9A, May 23, 1990, "Repair Work Completed On Shuttle Columbia," **THE ORLANDO SENTINEL**, p. A-10, May 24, 1990.]

□ LAUNCH: MAY 30

"At this point, it looks like we're going to be ready to launch on the 30th," NASA spokesman **Bruce Buckingham** said today. That is the expected result of today's Flight Readiness Review at Kennedy Space Center. Technicians have successfully completed a final check of the repaired cooling system on Columbia and final work in the Orbiter's cargo bay and rear engine compartment will be completed May 24, Buckingham said. Columbia and its crew of seven will deploy the Astro-1 observatory which consists of four telescopes that will study clusters of stars, exploding galaxies and other celestial subjects. The crew will operate the observatory and bring it home to Earth at the conclusion of their nine-day mission. [Halvorson, **FLORIDA TODAY**, p. 5A, May 24, 1990.]

□ MAY 30: IT'S OFFICIAL

"We're not tracking any significant problems. We're going to press on for a launch on the 30th," said NASA spokeswoman **Lisa Malone**. NASA officials made May 30th the official launch date for STS-35 which carries the ASTRO-1 astronomical observatory payload. The ASTRO-1 consists of four ultra-violet and X-Ray telescopes that will observe celestial objects during the nine days of the mission. The Delta 1 launch of a West German scientific satellite has been pushed back now until June 1 between 5:35 and 6:34 p.m. Today, pad workers will install Columbia's explosive devices which separate the Shuttle from its solid rocket boosters and external tank. Countdown is scheduled to begin at 1 a.m. May 27. [Halvorson, **FLORIDA TODAY**, p. 1A, May 25, 1990, Banke, **FLORIDA TODAY**, p. 6A, May 26, 1990.]

□ 1991'S ASTRONAUTS ANNOUNCED

Seventeen NASA astronauts will participate in three Space Shuttle missions in 1991, NASA announced today. The crew assignments bring the

number of Shuttle crews in training to 12, according to NASA spokesman **Jeff Carr**. Three of the nine flights scheduled for 1991 have not yet had crew assignments completed.

In March 1991, Navy Captain **David Walker**, Commander, will make his third trip into space aboard a Department of Defense mission. The mission's Pilot will be Air Force Lt. Col. **Terrance "Tom" Henricks**. Mission Specialists for the flight include **Story Musgrave**, Navy Lt. Commander **Mario Runco** and Army Lt. Col. **James Voss**. Henricks, Runco and Voss are space rookies.

An April 1991 mission for Columbia will be commanded by **Charles Bolden**, piloted by first-timer **Brian Duffy** and will include Mission Specialists rookie **Michael Foale** and Shuttle veterans **Kathryn Sullivan** and **David Leestma**. Payload Specialists will be rookie **Michael Lampton** and **Byron Lichtenburg**, who flew aboard Columbia in 1983.

John Blaha, who has twice served as Shuttle Pilot, will command a TDRS mission in May 1991. The Pilot for the mission will be **Michael Baker**, who will make his first trip into space. Mission Specialists are veterans **Shannon Lucid**, **David Low** and **James Adamson**. [halvorson, **FLORIDA TODAY**, p. 5A, May 25, 1990.]

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CHLORINE LEAK NEAR KSC

A small chlorine leak discovered at a water pump station near Kennedy Space Center caused disruption in traffic and the precautionary evacuation of a family living nearby. The leak occurred about noon at a pump station south of KSC Gate 2 on State Road 3. **Dick Young**, spokesman for NASA, said, "It was a very minor leak. We sent the firefighters in and they capped it within about 10 minutes. We wanted to make sure there was nobody within a half-mile of the pump station while the firefighters were doing the repair work." Traffic in the area was stopped for about 30 minutes and no injuries resulted from the incident. [Halvorson, **FLORIDA TODAY**, p. 1B, May 25, 1990.]

May 25:

KSC SHUTTLE LANDINGS: 1991 MAYBE

"Everybody would like to start landing at Kennedy again, but some people feel we need to proceed cautiously because there is inherently more risk," said Shuttle astronaut **Brewster Shaw**, who is also Deputy Director of Shuttle Program Management at Kennedy Space Center. "We have to convince ourselves that whatever additional risk we would be accepting

is worth the gain we would be getting," he said. Top program managers will meet in June to consider the question of KSC landings.

The dry lake bed runways at Edwards Air Force Base (CA) have been preferred because they offer 22 landing options on runways that range up to 7 1/2 miles long and are twice as wide as KSC's concrete strip. "People like the Edwards' lake-bed complex largely for that reason. Kennedy gives us two ends of the same runway to work with and that's it," said Shaw. Landings at KSC are being reconsidered in part because of the improvements which have been made in the Orbiter's brakes and in its nosewheel steering system. If improvements can be made in forecasting fast-changing weather patterns in Florida, then Kennedy Space Center landings could come as early as 1991. [Halvorson, **FLORIDA TODAY**, pp. 1A-2A, May 26, 1990.]

May 26:

ASTRO-1 CREW CHANGES

Three astronauts once primed to participate in the Astro-1 flight are now doing other things: one in private industry and two within NASA. All mission assignments had been dissolved after the Challenger accident which occurred just before Astro-1 was to have launched in March 1986. When new assignments were made for the STS-35 mission, Astro-1 retained five of its original crew members and added two new members. **Jon McBride** was to have commanded the mission but retired from NASA to take a job in private industry. He was replaced by **Vance Brand** who will be making his fourth, and perhaps last, Shuttle flight.

Pilot **Guy Gardner** and Mission Specialist **John "Mike" Lounge** replaced original Pilot **Richard Richards** and Mission Specialist **David Leestma**, both of whom received new assignments. Richards is training for the Ulysses flight in October and Leestma is serving as acting deputy director of flight crew operations at Johnson Space Center. The rest of the crew includes Mission Specialists **Jeffrey Hoffman** and **Robert Parker** and Payload Specialists **Samuel Durrance** and **Ronald Parise**. [Higginbotham, **FLORIDA TODAY**, pp. 7E and 8E, May 27, 1990.]

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ASTRO-1: FOUR TELESCOPES

Columbia's STS-35 Astro-1 payload comprises four complex telescopes mounted and operated inside the Orbiter's Payload Bay. The telescopes include: the Hopkins Ultraviolet Telescope; the Wisconsin Ultraviolet Photo-Polarimeter Experiment; the Ultraviolet Imaging Telescope and the Broad Band X-Ray Telescope. All but one telescope - the Ultraviolet Imaging Telescope - uses radio waves to send information to Earth. The

Ultraviolet Imaging Telescope records images on film that will be developed on Earth after Columbia lands. [Banke, **FLORIDA TODAY**, p. 9E, May 27, 1990, Glisch, **THE ORLANDO SENTINEL**, May 27, 1990.]

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RESURFACING CONTRACT LET

MacAsphalt, a division of APAC-Florida Inc. (Winter Haven, FL) has been awarded a \$280,234 contract to repave a section of Saturn Causeway which runs along the south side of the Vehicle Assembly Building to Launch Pads 39A and 39B. The work is scheduled for completion by September 9, 1990. ["Company Lands KSC Contract," **FLORIDA TODAY**, p. 10E, May 27, 1990.]

May 27:

STS-35 COUNTDOWN PROCEEDS

Countdown for the STS-35 liftoff began this morning at 12:30 a.m. headed toward launch at 12:38 a.m. May 30. Air Force meteorologists predict an 80% chance that weather will be favorable for liftoff. A tropical depression which had brought winds and rain to the area has lessened and will not affect Columbia's opportunities for launch, according to the Air Force. The crew of Commander **Vance Brand**, Pilot **Guy Gardner**, Mission Specialists **John "Mike" Lounge**, **Jeffrey Hoffman** and **Robert Parker** and Payload Specialists **Ronald Parise** and **Samuel Durrance** arrived at the Shuttle Landing Facility today at 11 a.m.

Wearing broad grins and personalized "Astro-1" caps - Houston Astro baseball caps - the STS-35 crew touched down on the space center's SLF. Commander Vance Brand, who will become the oldest (age 59) American astronaut to fly in space - spoke for the crew, "We're really glad to be here. We have a lot of good and important things to do. I just can't wait to get up there again."

NASA Test Director **Mike Leinbach** said, "This is the smoothest countdown I've been involved with so far. It's not normal, but that's the way we like it." Weather is expected to be good for launch, but KSC is watching for possible early evening thunderstorms on May 29 which may affect fueling operations. "The potential for an early evening storm is 30 percent," said KSC spokeswoman **Lisa Malone**. [Banke, **FLORIDA TODAY**, p. 1A, May 27, 1990, Brown, **FLORIDA TODAY**, p. 1A, May 28, 1990.]

May 29: WEATHER SHOULD HOLD FOR LAUNCH

Launch of STS-35 remains scheduled for 12:38 a.m. tomorrow morning; the weather is expected to cooperate for the liftoff. "The payload is in great shape. Everything is perfect. We're ready to fly," said **Geoffrey Clayton**, Deputy Program Scientist. However, there is a possibility that thunderstorms may delay fuel loading this afternoon. Columbia has until 3:17 a.m. tomorrow to launch. [Brown, **FLORIDA TODAY**, p. 1A, May 29, 1990, "NASA Confirms May 30 Launch for Columbia," **THE MIAMI HERALD**, p. 2A, May 25, 1990, Hoversten, **USA TODAY**, p. 1A, May 29, 1990.]

□ HYDROGEN LEAK SCRUBS COLUMBIA

A hydrogen leak was discovered today while fuel was being loaded into Columbia; the launch was delayed at least until June 1. Managers worked through the night discussing options while workers continued to pump hydrogen in an effort to isolate the leak. Kennedy Space Center spokeswoman **Lisa Malone** said, "A new target launch date will be set as soon as the problem has been identified and corrected." NASA spokeswoman **Patricia Phillips** said, "They shut it down to be safe. You simply cannot have excess hydrogen in what amounts to a controlled explosion at liftoff." The crew had not boarded Columbia when the scrub was announced.

Engineers think the problem is in the Orbiter's propulsion system. If the problem is in the ground support equipment, workers would need about two days to make repairs. If, however, workers must enter Columbia's aft compartment to correct the problem, the delay could be four days. If the problem cannot be fixed by June 4, the launch will be postponed another seven days so workers can service the X-Ray telescope in the payload bay of the Shuttle. The seven-member crew will remain at the Space Center to continue practicing landings and attend briefings. [Maugh and Dye, **THE LOS ANGELES TIMES**, p. 17, May 30, 1990, Broad, **THE NEW YORK TIMES**, p. A10, May 30, 1990, Brown, **FLORIDA TODAY**, pp. 1A-2A, May 30, 1990, "Hydrogen Fuel Leak Scrubs Shuttle Launch," Glisch, **THE ORLANDO SENTINEL**, p. A-1, May 30, 1990, **USA TODAY**, p. 3A, May 30, 1990, Merzer, **THE MIAMI HERALD**, p. 11A, May 30, 1990, "Shuttle Fuel Leak Delays Launch For At Least A Week," **THE MIAMI HERALD**, p. 4A, May 31, 1990, "Shuttle's On Hold for At Least A Week," **USA TODAY**, p. 3A, May 31, 1990.]

May 30:

SPACEPORT FLORIDA BILL PASSED

Spaceport Florida officials will have more money to spend because of a bill just sent to Governor **Bob Martinez** for his expected signature. The appropriation bill allows Spaceport officials to spend up to \$500 million in bonds for construction projects. Previously the organization had been allowed to spend up to \$210 million. Expenditures still must be approved by both Governor Martinez and the Cabinet. ["Spaceport Florida Bill Approved," **FLORIDA TODAY**, p. 1B, May 31, 1990.]

□

ROLLBACK: 50-50 ODDS

The possibility surfaced in a NASA press conference today that Columbia will have to be rolled back to the VAB to repair a liquid hydrogen fuel leak. The delay would be about a month. "We hope it doesn't come to that," said **Robert Sieck**, Shuttle Launch Director at Kennedy Space Center. In addition to the suspected fuel-line leak, technicians found a minor leak in ground-support equipment that delivers propellants to the Shuttle. The two leaks prohibited the launch.

Bascom Murrah, Pre-Launch Operations Manager for Columbia, said, "It's hard to believe, at the rate of leak we've seen, that we missed it. Something gave. But it's a guessing game until we in there." Sieck added, "If we can't duplicate the leak, then what we would want is a 100 percent inspection."

A rollback will delay at least one of the next two scheduled Shuttle missions: a Department of Defense mission aboard Atlantis set for July 9; a life sciences mission aboard Columbia whose launch date has already been moved from August 29 to mid-September.

Columbia's seven-member crew remained at Johnson Space Center to continue training for the mission. Playalinda Beach has been reopened. The delay in Columbia's launch could give the waiting Delta 2 a chance to proceed with its launch of a German scientific satellite (ROSAT). That launch is set for June 1 between 5:35 and 6:35 p.m. [Halvorson, **FLORIDA TODAY**, pp. 1A-2A, May 31, 1990, Broad, **THE NEW YORK TIMES**, p. A12, May 31, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-8, May 31, 1990.]

□

MINOR DAMAGE TO ATLAS CENTAUR

General Dynamics' Atlas Centaur rocket was damaged during a routine test at Cape Canaveral Air Force Station's Launch Complex 36B. The

rocket is scheduled for launch on June 23. Officials said a helium line failed while it was being pressurized during a tanking test; the failure caused two small holes to be bored into an adapter between the Atlas rocket and its Centaur upper stage. General Dynamics Corp., which manufactures the Atlas-Centaur, is conducting an investigation to assess damage and determine whether the damage will delay the launch. ["Rocket Damage Could Delay Launch," **FLORIDA TODAY**, p. 1A, May 31, 1990.]

May 31:

LEAK BAFFLES NASA

"I hope we don't have to roll back, but I can tell you that we will roll back if we have to," said NASA Administrator **Richard Truly** about the leak that has grounded Columbia's STS-35 mission. Inspections and tests today in Columbia's engine compartments proved fruitless. Technicians did discover a minor leak in a quarter-inch diameter line in the engine compartment and a microscopic leak in ground-support equipment but neither of those was responsible for the scrub, according to **Karl Kristofferson**.

On June 1, NASA plans to pump helium through the fuel lines to try to pinpoint the leak which required the scrub. Technicians primarily suspect a 17-inch diameter line that feeds propellants to Columbia's propulsion system. Secondly, NASA will consider running super-chilled liquid hydrogen through the system to try and duplicate conditions leading to the leak on May 29. The second test would not be conducted until next week and that would delay a decision on rolling back Columbia. [Halvorson, **FLORIDA TODAY**, p. 1A, June 1, 1990, "NASA Finds Tiny Leak in Shuttle, Looks For More," **THE MIAMI HERALD**, p. 12A, June 1, 1990.]

□

APOLLO 1 DEBRIS WON'T MOVE

For the present, NASA has chosen not to move the Apollo 1 spacecraft to Kennedy Space Center for storage and will not offer it to the National Air & Space Museum. [See story for May 16.] **William Sheehan**, NASA's Associate Administrator for Communications said, "Leaving everything as it is will keep everyone happy. We thought it wise." **Lin Ezell**, Assistant Director for Collections Management at the Smithsonian, said the museum still wants it. "At the appropriate time the museum looks forward to making a responsible decision about whether it wishes to assume the role of caretaker of this historic artifact."

NASA spokesman **Mark Hess** said the decision to keep the capsule at Langley indefinitely was made after conferring with relatives of the three

astronauts who died and former Apollo astronauts. "They just asked us to reconsider and keep it, or store it in another way." Displaying the capsule at the Smithsonian or anywhere else was never seriously considered, Hess said. "I don't think you'd find a soul in NASA who thought that was an appropriate alternative," he said. Thirty-one cartons of hardware and investigative material were moved to Kennedy Space Center in late April for burial with the capsule. They will be returned to Langley. [Banke, **FLORIDA TODAY**, p. 9A, June 1, 1990, "Plan to Bury Apollo at Cape Air Base Called Off," **THE ORLANDO SENTINEL**, p. A-4, June 1, 1990.]

JUNE

June 1:

ROSAT SET FOR LAUNCH

"Please keep your fingers crossed that we will have good weather for launch," said **Joachim Truemper**, ROSAT scientist about today's expected launch of a Delta 2 between 5:35 and 6:35 p.m. Inside the Delta 2 is the \$273 million Roentgen Satellite (ROSAT), named after German scientist **Wilhelm Conrad Roentgen**, who discovered X-Rays in 1895. ROSAT is a joint venture of West Germany, Great Britain and the United States. "To get the whole picture about what is happening in the universe, one has to have all of these wavelengths from infrared to gamma rays. X-Ray astronomy is sort of one-quarter of this major picture," said **Alan Bunner**, ROSAT Program Scientist at NASA Headquarters.

ROSAT will survey the universe to identify as many sources of X-Ray radiation as possible. "Today we know of about 1,000 X-Ray sources. When ROSAT will perform its sky survey, we expect to identify another 100,000 X-Ray sources. It is the most ambitious project in the young history of X-Ray astronomy," said **Volker Kaltenbach**, ROSAT Spacecraft Manager for the German Aerospace Research Establishment of West Germany. The satellite will also make detailed observations of specific X-Ray sources. [Banke, **FLORIDA TODAY**, p. 1A-2A, June 1, 1990.]

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ROLLBACK CHANCES INCREASE

The possibility that Columbia will be rolled back to the Vehicle Assembly Building is increasing in likelihood. "If it was 50-50 the other day, it's probably 60-40 now because we haven't had much luck finding the leak," said Deputy Director of Shuttle Operations **Brewster Shaw**. Testing continues and engineers are fairly certain that the Orbiter's leak is in or near a 17-inch diameter line that feeds fuel to the main propulsion system. "But I'll have to admit," Shaw continued, "we're not terribly optimistic we'll find something with the test that we can fix at the pad." [Halvorson, **FLORIDA TODAY**, p. 1A, June 2, 1990.]

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GENERAL DYNAMICS LAUNCH DELAYED

The Atlas-Centaur which General Dynamics was to have been launched June 23 has been delayed at least 16 days because of minor damage to the rocket. General Dynamics spokesman **Jack Isabel** said a helium line failed when it was being pressurized. The failure caused two small holes to form in an adapter between the rocket and its Centaur upper stage, he said. The adapter is to be repaired at its Cape Canaveral Air Force Station Complex

36B pad. ["General Dynamics Launch Delayed," FLORIDA TODAY, p. 5A, June 2, 1990.]

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DELTA 2 ROCKET LAUNCHED

At 5:48 p.m. today, the Air Force launched a Delta 2 rocket which carries a spacecraft that will picture for humans the usually invisible X-Ray and extreme ultraviolet light. The Roentgen satellite (ROSAT) was a joint venture of West Germany, the United Kingdom and the United States. During its 1 1/2-year mission the spacecraft will focus X-Ray and extreme ultraviolet telescopes on outer space to search for clues about the origins and evolution of the universe. [Banke, FLORIDA TODAY, p. 5A, June 2, 1990, "Rocket Lifts Off With Satellite Payload," THE ORLANDO SENTINEL, p. A-3, June 2, 1990.]

June 2:

INTELSAT LAUNCH SET

Martin Marietta plans to launch its second INTELSAT communications satellite on June 21 - at 7:18 p.m. - from Cape Canaveral Air Force Station. The first INTELSAT launch on March 14 was an unsuccessful mission when the spacecraft failed to separate from its upper-stage booster. The same problem was discovered in the rocket being prepared for the upcoming launch. ["INTELSAT Set For June 21 Launch," FLORIDA TODAY, p. 8E, June 3, 1990.]

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MARTIN MANAGER OF YEAR: FIELDS

W. E. Fields, Director of Martin Marietta Canaveral Operations, has been named Manager of the Year of the company's Astronautics Group. Fields was honored for meeting program requirements for Titan launches at Cape Canaveral Air Force Station, including launch complex construction and maintenance; assembly and checkout of boosters and payloads; managing customers and subcontractors; and launching the rockets. ["Fields Cited for Titan Launch Work," FLORIDA TODAY, p. 7E, June 3, 1990.]

□

CHIEF SCIENTIST FOR SPACE STATION

The new Chief Scientist for the Space Station Freedom Program is William W. L. Taylor, a space program veteran who has been employed by TRW Inc. (Redondo Beach, CA). The announcement was made by Richard Kohrs, Director of NASA's Space Station Program. ["California Scientist To Head Space Station Program," FLORIDA TODAY, p. 7E, June 3, 1990.]

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KSC SMALL BUSINESS CONTRACTS

Genesis VII Inc. (Titusville, FL) has won a \$49,636 contract to provide electronic equipment for Kennedy Space Center's Operations Support Building's Broadband Communications Distribution System. MicroAge Computer Store (Melbourne, FL) was awarded a \$32,081 contract to supply high-resolution color monitors, video cards and cables to the space center. ["Local Firms With KSC Business," **FLORIDA TODAY**, p. 8E, June 3, 1990.]

□

ASTRO-1 LAUNCH: 1991 POSSIBLE

Columbia's STS-35 mission (Astro-1) may be delayed until late this year or early 1991 in order to clear the launch schedule for a Pentagon mission and a Spacelab flight. Columbia's launch has been delayed indefinitely due to a leak, the source for which has not yet been discovered. Because of the delay, NASA officials think that only two Shuttle flights will be able to get off the ground before the planned launch of the Ulysses planetary probe aboard Discovery (October 5). If the Ulysses mission is not launched between October 5 and 23, the mission will be delayed for a year.

NASA is now considering two plans: Launch the Defense Department mission on July 9 and attempt to launch Astro-1 before October; Postpone the Astro-1 mission in order to launch both the Pentagon flight and a 10-day Spacelab Life Sciences Laboratory mission before Ulysses. "A final decision has not been made, but both options are being looked at," said Jeff Vincent, space agency spokesman. [Halvorson, **FLORIDA TODAY**, p. 1A, June 3, 1990, "Workers Fail to Spot Columbia Leak," **THE ORLANDO SENTINEL**, p. A-17, June 3, 1990.]

June 3:

LEAK SEARCH CONTINUES

Workers continued through the week-end for the hydrogen leak which grounded the STS-35 mission. Today workers completed a check which involved pumping helium through Columbia's propulsion system but the results did little to identify the source of the leak. "It checked out like it did prior to launch - there were no leaks," said Lisa Malone, Kennedy Space Center spokeswoman. "We're hoping the leak will reproduce itself." If the leak cannot be pinpointed on the pad, the Orbiter will be rolled back from Launch Pad 39A. [Brown, **FLORIDA TODAY**, p. 1A, June 4, 1990, "STS-35 Launch On Hold While Technicians Look for Hydrogen Leak," **MARSHALL STAR**, pp. 1-2, June 6, 1990.]

June 4:

EG&G CONTRACT TALKS

Contract talks between Base Operations Contractor EG&G Florida Inc. and the International Association of Machinists and Aerospace Workers are expected to resume June 6. The union, which represents about 700 workers, has been without a contract since June 2, when their previous three-year agreement expired. ["EG&G Employees Might Strike," **FLORIDA TODAY**, p. 1B, June 3, 1990, "EG&G Contract Talks To Resume," **FLORIDA TODAY**, p. 2B, June 5, 1990.]

□

DISCOVERY BAY DOOR ACCIDENT

One of Discovery's payload bay doors may have been damaged today in an accident in the Orbiter Processing Facility. Part of Discovery's right bay door bent upward when support equipment was attached to move the door at 8:30 a.m. A technician noticed the door bowing 10 to 12 inches, which was contrary to its design.

Lisa Malone, Kennedy Space Center spokeswoman said, "They moved the bucket and bridge back to the original position and the door returned to its original shape. We don't know if there is any damage to the flight hardware, but there is probably some damage to the ground support equipment. **Bruce Buckingham**, another KSC spokesman said, "There is no visual damage. However, the Orbiter has some very critical components that aren't meant to be bent."

Randy Segert, Vehicle Systems Manager at NASA Headquarters, said that inspectors will focus on the 16 hinges that connect the door to Discovery. The hinges are more fragile than the door, which appears undamaged, NASA said. Lockheed Space Operations Co., Shuttle Processing Contractor, said through its spokesman **J. B. Klump**, that the technician working on the cargo bay liner was experienced and certified for the work and that no action was taken against the employee. ["Another Shuttle Suffers Problems," **THE NEW YORK TIMES**, p.B6, June 5, 1990, Banke, **FLORIDA TODAY**, pp. 1A-2A, June 5, 1990, Glisch, **THE ORLANDO SENTINEL**, June 5, 1990, Harrington, **DISCOVERY PAYLOAD BAY DOOR INCIDENT**, KSC DOME, June 4, 1990.]

□

COLUMBIA'S LAUNCH PROSPECTS

Technicians at Launch Complex 39 are preparing Columbia for another leak check tomorrow. This check will determine whether the Shuttle will have to be moved off the launch pad for repairs. Columbia's external tank will be filled with liquid hydrogen as part of the test. "We've pretty well

assured ourselves that it's not going to show itself [the leak's source] until it's subjected to the super-cold temperature of the hydrogen," said Kennedy Space Center spokesman **Bruce Buckingham**. "The longer we can't find it, the better the chances of moving back," to the Vehicle Assembly Building, he said. "Right now, the chances of not moving back are getting slimmer and slimmer." A rollback would mean a delay of up to one month. Rollbacks have occurred twice before, in 1983 and 1984.

Columbia Processing Manager **Bascom Murrah III** said, "Let's hope we get lucky and get this bird up where she belongs." NASA Managers were looking at two post-rollback options: If Columbia can be repaired within two days in the VAB, the Shuttle will be rolled back out to the pad and launched, according to Murrah. If repairs take longer than two days, Atlantis will be moved to the pad for launch of a Department of Defense mission which had been scheduled for July 9.

The mission might also be delayed until after Discovery's Ulysses mission, but NASA Managers have ruled out bumping Columbia's Astro-1 flight into 1991. However, one of Columbia's two other flights scheduled for this year, would be delayed into 1991, said Murrah. ["Another Shuttle Suffers Problems," **THE NEW YORK TIMES**, p. B6, June 5, 1990, Banke, **FLORIDA TODAY**, pp. 1A-2A, June 5, 1990, "NASA Plans Another Try to Find Columbia's Leak," **THE ORLANDO SENTINEL**, June 5, 1990, **KSC SHUTTLE STATUS, STS-35 - COLUMBIA (OV-102) - PAD 39-A**, June 4, 1990.]

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STS-35 PAYLOAD STATUS REPORT

The payload team continued to monitor the ASTRO-1 payload as the launch team investigated the source of the hydrogen leak which scrubbed the STS-35 launch attempt on May 30. Since the Broad Band X-Ray Telescope was serviced with solidified argon gas on May 27 in preparation for launch, the telescope is still protected by the cooling provided by two dewars of argon. Launch managers have decided for the time being not to reservice BBXRT until further tests are performed on the orbiter/external tank this week. Since the May 27 servicing prepared the telescope for a 10-day mission, the instrument's health will not be affected. BBXRT does not require servicing with argon coolant until June 11. The BBXRT has been serviced over two dozen times since its arrival at Kennedy Space Center in October, 1989. [Phillips, STS-35, 40 AND 42 PAYLOAD STATUS REPORT, June 4, 1990.]

June 5:

COLUMBIA'S LEAK TESTS CONTINUE

A last-ditch effort will be made today to detect the source of a leak that has grounded Columbia's STS-35 mission indefinitely. Technicians will pump superchilled liquid hydrogen into the Orbiter's external tank. "That looks like the only way we're going to find it [the source of the leak]," said **Brewster Shaw**, Deputy Director of Shuttle Program Operations. "By getting the system down to (superchilled) temperatures, that should open up the leak again," he said. If the leak source cannot be located and repaired at Launch Pad 39A, Columbia will be rolled back to the Vehicle Assembly Building. [Halvorson, **FLORIDA TODAY**, p. 6A, June 6, 1990, **KSC SHUTTLE STATUS, STS-35 - COLUMBIA (OV 102) KSC Dome**, June 5, 1990.)

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ACCIDENT INVESTIGATION TEAM

NASA today will name an investigation team to study an accident that may have damaged one of Discovery's payload bay doors. The possible damage occurred when a corner of the payload bay door was snagged by an overhead bridge, which acts as a crane. The open right door bent ten to twelve inches upward, then snapped back into position. [Halvorson, **FLORIDA TODAY**, p. 6A, June 6, 1990, **KSC SHUTTLE STATUS, Tuesday June 5, 1990: STS-41 - Discovery (OV-103) - OPF Bay 1.**]

June 6:

ORLANDO SPACE CONFERENCE

A three-day conference focusing on space technology and commercialization opens today in Orlando, FL. Among the topics to be discussed are: future U. S. missions, Spaceport Florida, space-based environmental monitoring programs and space communications. The conference begins at 1 p.m. at Walt Disney World Swan Hotel with sessions to continue on June 7 and 8. ["Space Conference Opens in Orlando," **FLORIDA TODAY**, p. 8E, June 3, 1990.]

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COLUMBIA TO ROLL BACK

"We don't see anything that is going to keep us from having to travel back to the VAB [Vehicle Assembly Building]," NASA Shuttle Launch Director **Robert Sieck** said. Today NASA technicians found the source of the leak which scrubbed Columbia's STS-35 mission and determined that repairs could not be done on the pad. NASA engineers continue to study the cause of the leak. Sieck says the leak appears to be in or near a tight cavity between two metal plates that connect the Orbiter and its external

tank. He said that additional tests to the fuel line area are planned for the rest of the week to prepare for repairs.

NASA's Shuttle Program Director **Robert Crippen** will hold a news conference today to discuss upcoming Shuttle launch schedule changes. A Spacelab Life Sciences Laboratory mission scheduled for Columbia in mid-September will likely be delayed until late this year or early 1991. Two other Columbia flights - the International Microgravity Laboratory scheduled for December and the Atmospheric Laboratory for Applications and Science, April 1991 - may be delayed as much as four months. On June 8, Atlantis will be towed from the OPF [Orbiter Processing Facility] to the VAB and a mobile platform will be moved out to accommodate the returning Columbia, Sieck said. [Halvorson, **FLORIDA TODAY**, pp. 1A-2A, June 7, 1990, "Nationline: Shuttle Setback," **USA TODAY**, p. 3A, June 7, 1990, "Shuttle Leak Delays Launch Indefinitely," **THE MIAMI HERALD**, p. 17A, June 7, 1990, "Shuttle Must Go to Repair Hangar," **THE NEW YORK TIMES**, P. A12, June 7, 1990, **KSC SHUTTLE STATUS, STS-35 - COLUMBIA (OV 102)**, June 7, 1990.]



PAYLOAD BAY DOOR INVESTIGATION

An investigation board has been named by Center Director **Forrest McCartney** to examine the circumstances surrounding the June 4, 1990, mishap which involved improper raising of the Orbiter Discovery's right hand payload bay door in the Orbiter Processing Facility's High Bay 1. Discovery is currently being processed for the STS-41 Ulysses mission, scheduled for launch October 1, 1990.

Chairman of the board is **Paul Myers**, Technical Assistant to KSC's Director of Engineering Development. **Hector Delgado**, of the Systems Assurance Office, Reliability and Quality Assurance Directorate is the Deputy Chairman. Other members of the board are: **Charles Stevenson**, Chief, External Tank Section, Vehicle Engineering; and **Tim Yang**, Facilities Systems Engineer, Mechanical and Electrical Systems Branch, Facilities and Systems Operations Division, Center Support Operations Directorate. Two additional board advisors are: **Laurie Walls**, Engineer, Structures, Handling and Access Systems Section, Vehicle Engineering, and **Larry Irminger**, Lockheed Space Operations Company.

Ex-Officio board members are **Elizabeth Gruhler**, Safety Advisor, **Douglas Hendricksen**, Legal Advisor and **Lisa Malone**, Public Affairs Advisor. **Elliot Kicklighter**, Primary Assistant to the Deputy Director, National Space Shuttle Operations, has been appointed as a Level II observer.

On June 4, at about 8:30 a.m., Discovery's right hand payload bay door was configured for closing. Special fixtures used to handle Orbiter doors in the earth's gravity were in place for the operation. The fixtures are attached to and controlled by the overhead bridge. An accidental movement of the overhead bridge caused the payload bay door to flex for a short period of time. Board functions include investigating the facts surrounding the mishap, determination of its probable cause, assessments of the possibility of a recurrence, and recommendations on corrective actions. A final report is due by mid-July. [Malone, "Board Appointed to Investigate Improper Raising of Payload Bay Door," KSC RELEASE No. 99-90, June 6, 1990, Halvorson, **FLORIDA TODAY**, pp. 1A-2A, June 7, 1990, "NASA Looks for Damage on Discovery's Door," **THE MIAMI HERALD**, p. 5A, June 5, 1990.]

June 7: **NASA'S REVISED LAUNCH SCHEDULE**

Shuttle Program Director **Robert Crippen** today outlined NASA's revised launch schedule which will include only 8 of the originally planned 9 flights. In mid-July, Atlantis will carry a secret Department of Defense payload. In mid-August, Columbia will fly the problem-plagued Astro-1 mission. The Ulysses planetary probe mission should launch aboard Discovery in early October. The Gamma Ray Observatory mission is scheduled for early November aboard Atlantis and a Spacelab Life Sciences Laboratory mission, originally scheduled for August 29, will occur aboard Columbia in early December. Rollback for Columbia to the Vehicle Assembly Building will begin at 4:00 a.m. June 12. [Halvorson, **FLORIDA TODAY**, p. 4A, June 8, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-1, June 8, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-6, June 8, 1990.]

June 8: **AIR FORCE LAUNCHES TITAN 4**

The Air Force launched an 18-story Titan 4 rocket with a top-secret payload this morning at 1:22 from Launch Complex 41 at Cape Canaveral Air Force Station. **Martin C. Faga**, Assistant Secretary of the Air Force for Space, said, "This was an important launch for America's space program. The Titan 4 is the largest booster ever launched by the Air Force and is the backbone of our space booster family. "Since the Challenger accident January 28, 1986, Martin Marietta's Air Force contract has grown from \$2 billion for 10 Titan 4's to \$7.4 billion for 41 rockets. [Halvorson, **FLORIDA TODAY**, p. 1A, June 8, 1990, Halvorson, p. 1A, June 9, 1990, "Titan 4 Rocket Blasts Into Space," **THE MIAMI HERALD**, p. 11A, June 9, 1990, Sawyer, **THE WASHINGTON POST**, p. A4, June 9, 1990.]

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ATLANTIS ROLLS TO VAB

Atlantis moved a necessary 1/4 mile closer to launch today when it was rolled over to the Vehicle Assembly Building from the Orbiter Processing Facility. "She looks great. We're ready to go fly," said Atlantis' Ground Operations Manager Conrad Nagel. He said that Atlantis should be ready to roll out to Launch Pad 39B - replacing Columbia - on June 15. [Halvorson, **FLORIDA TODAY**, p. 4A, June 9, 1990.]

June 9:

ATLANTIS TAKES COLUMBIA'S PERCH

Atlantis will replace Columbia on Launch Pad 39B this week in preparation for its July Department of Defense mission. Ground Operations Manager Conrad Nagel said testing so far shows that Atlantis will not be grounded by the same type of hydrogen leak that scrubbed Columbia's mission. "We've been back through all the testing we've been asked to do and we're clean," Nagel said. "There's no reason to believe we have a generic problem. I think everybody feels like what we have out there with Columbia is unique to that tank and Orbiter."

Nagel went on to say that officials believe the leak is in or near a line that feeds fuel to Columbia's main engines from its external tank. Nagel said a bad seal is probably to blame. Atlantis has been mated with its external tank and solid rocket boosters. A three-day test to verify mechanical and electrical connections between Shuttle elements and the launch platform begin June 12 and rollout will occur June 15, starting at 12:01 a.m. A two-day practice countdown will begin June 19. Launch is set for July 10 or 11, Nagel said. [Halvorson, **FLORIDA TODAY**, p. 6A, June 12, 1990, "Shuttle Fuel Leak Raises Questions About Pipelines," **THE MIAMI HERALD**, p. 19A, June 13, 1990.]

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EG&G CONTRACT OK'D

About 700 EG&G Florida Inc. employees ratified a new three-year contract and averted a walkout. The International Association of Machinists and Aerospace Workers District 166 had been unable for more than a week to conclude an agreement with the Base Operations Contractor. Gil Patton, Director of Industrial Relations for EG&G, described the vote "as a satisfactory ratification with the majority of members voting." [Halvorson, **FLORIDA TODAY**, p. 2B, June 10, 1990.]

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COMMERCIAL LAUNCHES OCCUPY CAPE

In the next five weeks, the Cape Canaveral Air Force Station's launch schedule features three commercial-space rocket launchings. On June 12, McDonnell Douglas will launch a Delta rocket carrying an Indian communications satellite. Martin Marietta will launch a Titan 3 on June 21; its payload is an INTELSAT satellite. On July 11, General Dynamics is scheduled to enter the commercial-space launch business when it launches an Atlas 2 rocket carrying a NASA satellite designed to study the Earth's radiation belts and its magnetic and electric fields. [Glisch, **THE ORLANDO SENTINEL**, p. A-23, June 10, 1990.]

June 11:

FATAL CAR ACCIDENT

The victim of a fatal automobile accident on Kennedy Space Center property has been identified as **Donald A. Simon** (Titusville, FL). Space Center spokesman **Dick Young** said Simon was traveling west when the car he was driving hit a utility pole near the intersection of SR 402 and SR 406. The ambulance that responded to Simon's accident was hit by a car which departed the scene without stopping. The driver was later detained and questioned, pending the filing of charges. ["Man Identified in KSC Accident," **FLORIDA TODAY**, p. 1B, June 12, 1990, "Driver Dies When Car Hits Pole," **THE ORLANDO SENTINEL**, p. B-3, June 11, 1990.]

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COLUMBIA'S ROLLBACK TO PROCEED

"We're still on for a rollback as planned," said **Lisa Malone**, NASA spokeswoman today concerning the return of Columbia to the Vehicle Assembly Building for repairs. Since Atlantis is already in the VAB, technicians made room by using a launch platform and crawler to move Shuttle booster segments out to Launch Pad 39B. Columbia's rollback is scheduled to begin at 4:00 a.m. June 12 and will mark the fourth such rollback of the Shuttle Era. Columbia will be demated after its arrival so technicians can repair the hydrogen leak which has grounded the Orbiter at least until mid-August. [Higginbotham, **FLORIDA TODAY**, p. 4A, June 11, 1990, Halvorson, **FLORIDA TODAY**, p. 1A, June 12, 1990, Sawyer, **THE WASHINGTON POST**, p. A3, June 13, 1990.]

June 12:

DROWNING AT KARS PARK

Kennedy Space Center Director **Forrest S. McCartney** has appointed a mishap investigation board to look into the cause of an accident that resulted in the drowning death of a 7-year-old girl at KARS Park I on June 9, 1990. The investigation board is required because the accident occurred

on KSC property. The girl - **Charlene I. Robinson** (Cocoa, FL) - was visiting KARS as part of an organized group using the park facilities.

The Board will begin meeting June 13, with a final report due by July 25, 1990. Members of the Board include: Chairman: **Edward H. Weber**, Associate Director of Shuttle Management and Operations; Members: **Cal Burch**, Security Operations Office; **Dennis Chamberlain**, Biomedical Operations and Research Office; Observers: **Lonnie Owen**, Safety Division (NASA), **Robert Stephens**, Office of the General Counsel (NASA); Advisors: **Alan Guerra**, Industrial Safety Branch, **Dudley Cannon**, Office of the Chief Counsel, **Patricia Phillips**, Public Affairs. ["McCartney Appoints Board to Investigate KARS Park Mishap," KSC RELEASE NO. 102-90, June 12, 1990, "NASA Investigates Girl's Drowning," FLORIDA TODAY, p. 1B, June 13, 1990.]

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COLUMBIA BACK IN VAB

"It's a disappointment to everybody to see anything roll back. But it's much better to see one coming back toward the VAB with a hydrogen leak than one going upstairs with a hydrogen leak," said **Gene Thomas**, Deputy Director of Kennedy Space Center. "Hydrogen is highly volatile. The slightest spark can start a hydrogen explosion that's unbelievable. You just don't take chances with hydrogen leaks," he said. Columbia made the 3.5 mile journey from Launch Pad 39B to the Vehicle Assembly Building in six hours. The roll back from the pad began at 4:25 a.m. and ended with its arrival at the VAB at about 10:30 a.m.

Technicians disconnected lines between the Orbiter, its external tank and its mobile launch platform. On June 15, Columbia will be towed to the Orbiter Processing Facility and the suspect valve will be shipped off to its manufacturer and a new one will be installed. "We know the leak is coming from the area around the valve and the valve is easier to replace than the tank," according to **Lisa Malone**, KSC spokeswoman. [Halvorson, FLORIDA TODAY, p. 1A, June 13, 1990, "Space Shuttle Columbia Moves Back to the Vehicle Assembly Building...", cutline, FLORIDA TODAY, p. 1B, June 13, 1990.]

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INDIAN SATELLITE LAUNCHED

At 1:52 this morning a McDonnell Douglas Delta 2 was launched from Cape Canaveral Air Force Station; an hour later its Indian payload, INSAT-1D, separated from the booster and deployed its solar arrays and communications antenna. India's Ambassador to the United States, **Abid Hussain**, said, "Through this particular satellite, we would like to spread

education and knowledge, science and new culture to hundreds and thousands who have been out of the mainstream of life." Over the next eight days, spacecraft controllers in India will boost the satellite to its 22,300 mile orbit above Earth. The updated series of INSAT-2 satellites is due to begin service late next year, with the first two to be launched by the European Space Agency's Ariane rocket. [Banke, **FLORIDA TODAY**, pp. 1A-2A, June 11, 1990, Brown, **FLORIDA TODAY**, p. 4A, June 13, 1990, Burnett, **THE ORLANDO SENTINEL**, p. A-3, June 13, 1990.]

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TITAN LAUNCH DELAYED

A faulty destruction mechanism has delayed the launch of a Martin Marietta Titan rocket for at least two days. The destruction mechanism is necessary to demolish the launch vehicle if there were a critical failure during flight. The payload for the Titan is an INTELSAT VI communications satellite. Launch is now scheduled for between 7:19 a.m. and 7:51 a.m. or 8:24 and 8:43 a.m. June 23. The time needed to replace the faulty receivers, test the new units and conduct a combined all-systems test of the Titan and its payload led to the delay in Martin Marietta's third commercial launch and second this year, according to company spokeswoman **Judith Stowell**. The launch March 14 of another INTELSAT VI was marred when the spacecraft was stranded in a useless orbit 345 miles above Earth. The failure was attributed to an engineering design failure. The INTELSAT company recently agreed to pay NASA \$90 million for a rescue effort of the stranded craft in February 1992. [Halvorson, **FLORIDA TODAY**, p. 4A, June 13, 1990.]

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PATTERSON REPLACES THOMAS AT LOCKHEED

"It is with a mixture of both pleasure and regret that I announce the promotion and transfer of **John Thomas**," said Lockheed President **Doug Sargent** today. Thomas has been chosen to be Program Manager for the Advanced Solid Rocket Motor Contract that NASA recently awarded to Lockheed Missiles and Space Co. Thomas will be replaced by **Dan Patterson**, Lockheed's Director of Orbiter Processing and Shops. **Gene Meyer**, who directs Lockheed's Orbiter Processing Facility projects, will replace Patterson. **Horace Lamberth**, it was also announced, will become Vice President and Chief Engineer. **Charlie Floyd**, now Lamberth's deputy, will become Vice President of Shuttle Ground Support Engineering. [Banke, **FLORIDA TODAY**, p. 4A, June 13, 1990.]

June 13:

KSC ROAD-WIDENING

Congressman **Bill Nelson** (D-Melbourne, FL) announced today that Congress has approved \$3.2 million to widen Kennedy Parkway to four lanes from the southern entrance to the space center to SR 402. Presently, the Parkway narrows from four lanes to two in the area between Fifth Street and KSC Gate 2, causing traffic bottlenecks for the three to four thousand drivers who use the southern entrance each day. The 2.5 mile project on KSC property will begin in January and be completed next summer. The Brevard County portion of SR 3 has already been started and is expected to be completed in July 1991. "The completion of these two projects next summer will erase one of the most frustrating bottlenecks in the county," said Nelson, who is also a candidate for the Democrat nomination for governor of Florida. [Halvorson, **FLORIDA TODAY**, p. 2B, June 14, 1990, "Funding Approved to Widen Kennedy Parkway," KSC RELEASE NO. 106-90, June 14, 1990.]

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ENDEAVOUR'S FIRST MISSION: INTELSAT

When the newest Space Shuttle joins the fleet at Kennedy Space Center its first mission will include the rescue of the INTELSAT satellite stranded in low orbit since March. The satellite's owners will pay NASA \$90 million for the rescue attempt in February 1992. "It's an exciting mission for NASA because it gives us a chance to exercise space-walking capabilities that will be needed for the Space Station Freedom Program," said **William Green**, a Payload Manager at NASA Headquarters in Washington, D. C. NASA spokesman **Jeff Carr** said, "To have the first flight of a new Orbiter is a plum, but to have that and a sexy flight like going up to pick up the INTELSAT, fix it and reboost it will just make any experienced crew commander's mouth water." [Halvorson, **FLORIDA TODAY**, p. 1A, June 14, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-10 & A-10, June 14, 1990.]

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NASA STATEMENT: INTELSAT

"All of us at NASA are pleased with today's announcement from the board of governors at Intelsat. The rescue offers us the opportunity for expanding our experience base in the planning, training and performance of extravehicular activity. Knowledge gained in this effort will help with the preparations for Space Station Freedom. The quickness with which a rescue plan was proposed and accepted is a reflection of the excellent working relationship developed in the past between the Space Shuttle Program and the commercial satellite industry. We are very pleased to be able to assist Intelsat and to have an opportunity to once again

demonstrate the versatility of the Space Shuttle." [Campion, NASA STATEMENT REGARDING INTELSAT DECISION, June 13, 1990.]

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SEPARATE NASA BUDGET NEGOTIATIONS

The Bush Administration wants Congress to consider his budget proposal for NASA separately from the remainder of his budget. President George Bush has requested \$15.2 billion for NASA, an increase of 24 percent over this year's \$12.3 billion budget. Budget summit talks resumed today for the seventh meeting since they were proposed by President Bush. ["President Bush Puts A Premium On Separate Space Agency Budget," FLORIDA TODAY, p. 4A, June 14, 1990.]

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1,000 NEW KSC JOBS

Kennedy Space Center Forrest S. McCartney told a Titusville Area Chamber of Commerce meeting that the Space Center is expected to add 1,000 jobs next year to meet the increased Space Shuttle schedule. "I think we'll max out at 12 flights a year," McCartney said. Currently 20,300 NASA and contractor employees work at the center. Speaking of future KSC plans, McCartney said that in 1991 construction will begin on a \$90 million complex for processing Space Station components and equipment. The first Shuttle launch of Space Station hardware will come in 1995. State Road 3 on NASA property will be widened [see above story] and a third Shuttle Processing Facility will be completed. Scaffolding and test equipment for the hangar are being transferred to KSC from a planned, but never-used Shuttle launch facility at Vandenberg Air Force Base, CA. Next year the fourth Shuttle - Endeavour - will arrive at Kennedy Space Center. [Brown, FLORIDA TODAY, p. 4A, June 14, 1990.]

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DELTA DEBRIS TO BE DESTROYED

Part of a Delta rocket motor casing, retrieved from Cocoa Beach on June 12, has been delivered to Cape Canaveral Air Force Station for disposal. Air Force Lt. Col. Bob Eberle said an explosive ordnance team from Patrick Air Force Base had pulled the debris ashore. The wreckage was subsequently transported to the Explosive Ordnance Division Range at CCAFS, where residual propellant, if any, will be destroyed. [Halvorson, FLORIDA TODAY, p. 5A, June 14, 1990.]

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ATLANTIS ROLLOUT DELAYED

Roll out of Atlantis to Launch Pad 39B will be delayed until next week to cut overtime costs for Shuttle technicians, NASA said today. "It will be a

substantial savings of several thousand man-hours," said NASA spokesman **Bruce Buckingham**. He said that the delay would give workers in the Vehicle Assembly Building more time to complete final preparations for roll out. Meanwhile, demating for Columbia was begun and preparations were made to move Columbia to the Orbiter Processing Facility for inspections June 15. [Halvorson, **FLORIDA TODAY**, p. 5A, June 14, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-6, June 16, 1990, **KSC SHUTTLE STATUS, STS-38 - ATLANTIS (OV-104)**, June 14, 1990.]

June 14: **LEAK LINKED TO TEST CHANGE**

NASA may have missed the leak which is delaying Columbia's launch by two months because it changed test procedures, according to **Jack Boykin**, Manager of the Orbiter Projects Office at Johnson Space Center (Houston, TX). The Space Shuttle Atlantis may also have the same leak problem, but that won't be known until super-chilled liquid hydrogen is pumped through the Orbiter's main propulsion system during the countdown for its launch in mid-July.

The fuel-line system, said Boykin, consists of two halves: a pipe and a valve connected to the Orbiter and a similar pipe and valve connected to the external tank. During testing, the pair connected to the tank normally is hooked up with a unit that mimics the Orbiter side of the fuel line. The tank lines for Columbia and Atlantis, however, were tested using a procedure that replaced the unit with a flat plate that might not be as effective in identifying leaks, he said.

Seven other Shuttle fuel lines were tested in 1984 under the same conditions as Columbia's, including the one on Atlantis. Two of the fuel lines were used during successful launches in March and November 1989; the four others are being prepared for missions later this year or in 1991. [Halvorson, **FLORIDA TODAY**, p. 1A, June 15, 1990.]

June 15: **LEAK TEST FOR ATLANTIS**

NASA said today that Atlantis might undergo a special test at the launch pad to determine whether it has a leak similar to one that grounded Columbia. NASA spokeswoman **Lisa Malone**, said, "We wouldn't want to get out to the pad and get into a launch countdown and find out we have a leak. We don't really have any evidence that there's a generic problem, but if we did have one the test would give us some early detection of it."

A similar leak aboard Atlantis would likely result in a one- to two-month delay in its Department of Defense mission which is scheduled for a mid-July launch. "If we find a leak condition out on the pad with Atlantis that is similar to the problem we have with Columbia, then we'll end up having to roll back and recover from that," said **Jack Boykin**, Deputy Director of the Orbiter Project Office. That would raise the possibility of repeated schedule disruptions for the remainder of 1990 and perhaps 1991.

Bob Wilders, a Senior Project Engineer with Parker Hannifin - the fuel line manufacturer - said, "If there is indeed a leak in the external tank line, we will be able to identify it." Boykin said that if a problem in Atlantis' line develops, then the line being built into Endeavour would be removed and sent to Florida. [Halvorson, **FLORIDA TODAY**, pp. 1A-2A, June 16, 1990.]

June 16:

BLAHA PRAISES KSC WORKERS

Astronaut **John Blaha**, speaking from the Astronaut Office at Johnson Space Center (Houston, TX), gave high praise to the workers at Kennedy Space Center today: "Without a doubt, I am confident in them. I think they are the finest group of people in the world. They work very hard and run into problems daily, even hourly, trying to support the flow of three spaceships. Whenever they see something they are not comfortable with, they tell people, and we rely on them for that."

"I honestly think every time a Shuttle lifts off I'm amazed when it goes," said Blaha. "That a Shuttle doesn't launch on day 'X,' to me, is business as usual, and I really admire those people at the Cape for being able to handle it. I wish there was a way we could pay them more money." Workers are preparing Atlantis for a June 18 rollout. [Banke, **FLORIDA TODAY**, p. 5A, June 17, 1990.]

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BECHTEL WINS MOD CONTRACT

Martin Marietta Corp. has awarded a \$100 million contract to Bechtel National Inc. to modify Launch Complex 40 for Titan 4 rockets. Under the two-year contract, Bechtel will provide engineering, construction and procurement services to Martin Marietta, which is the Air Force's prime contractor for the work. When completed in July 1992, the pad will be used for Titan 4, Commercial Titan and Titan 3 boosters. The Air Force currently has just one launch pad at Cape Canaveral that can be used for the new Titan 4 rockets. ["Bechtel Will Redo Launch Complex 40," **FLORIDA TODAY**, p. 10E, June 17, 1990.]

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TRAK WINS KSC CONTRACT

Kennedy Space Center has awarded a \$159,000 contract to Trak Microwave Corp. (Tampa, FL) for electronics equipment. Under the contract, the firm will supply display units to KSC over a 23-month period. The devices will be used in electrical ground-support equipment that controls and monitors Space Shuttle launch countdown operations. ["Trak Wins KSC Contract," **FLORIDA TODAY**, p.10E, June 17, 1990, Kristofferson, KSC NEWS RELEASE NO. 90-97, June 11, 1990.]

June 17:

MALONE WINS SILVER SNOOPY

Lisa Malone, Kennedy Space Center spokeswoman and launch commentator, was presented a Silver Snoopy Award by NASA astronaut **Curt Brown**. The award is given annually by the NASA Astronaut Corps to about 1 percent of space program workers nation-wide who have performed an outstanding effort contributing to the success of manned space flight missions. Brown wrote in a letter to Malone, "You brought great credit to the agency and to yourself for the crisp, calm, accurate and concise commentary describing launch preparations and liftoff to countless millions of listeners around the world." Malone, 28, is a Kennedy Space Center public affairs specialist who provided countdown commentary for the March 1989 Shuttle Discovery launch of STS-29. ["KSC Commentator Wins Silver Snoopy Award," **FLORIDA TODAY**, p. 9E, June 17, 1990.]

June 18:

ATLANTIS REACHES 39B

Atlantis crawled out of the Vehicle Assembly Building at 11:16 p.m. last night and arrived at Launch Complex 39B at 5:23 this morning. The STS-38 crew arrived some 15 hours later. The all-military crew includes Commander **Richard Covey**, Pilot **Frank Culbertson** and Mission Specialists **Charles "Sam" Gernar**, **Carl Meade** and **Robert Springer**. Today and tomorrow the crew will practice landings and emergency escape procedures. The practice countdown begins June 20 at 8 a.m. and concludes June 21 at 11 a.m. On June 27, NASA will conduct a fueling test to determine if Atlantis will evidence a leak like the one which scrubbed Columbia. The test was ordered by Shuttle Program Director **Robert Crippen** and involves pumping liquid hydrogen into the external tank and the propulsion system. "It will tell us early in the flow at the pad whether there's a leak in the Atlantis vehicle. If there is, we'd like to know about it as soon as possible," said **Lisa Malone**, Kennedy Space Center spokeswoman. [Halvorson, **FLORIDA TODAY**, p. 4A, June 19, 1990.]

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ASTRONAUT SALLY'S RIDE

On this date in 1983, astronaut Sally K. Ride became America's first woman in space as she and four colleagues rode into space aboard the Space Shuttle Challenger for the STS-7 mission. On that flight, the Anik C-2 and Palapa B-1 satellites were deployed and the Shuttle Pallet Satellite (SPAS-01) was deployed and retrieved with the RMS. [Lockheed Space Operations Company, **America In Space: A History of Accomplishment**, p. 24, "Breakfast Briefing," THE ORLANDO SENTINEL, p. A-3, June 18, 1990.]

June 19:

CREW ESCAPE PRACTICED

The five-man crew of STS-35 practiced emergency launch pad escape maneuvers in an armored tank today. "They did an excellent job, as always," said **Rick Talbert**, Launch Pad Rescue Team Leader for EG&G Florida Inc., Base Operations Contractor at Kennedy Space Center. "They are quick to learn. For most of them, it's like riding a bike. Their previous training comes back to them and they perform real well."

Crew members include Commander **Richard Covey**, Pilot **Frank Culbertson**, and Mission Specialists **Charles "Sam" Gemar**, **Carl Meade** and **Robert Springer**. The 25,000-pound refurbished tanks - also known as M113s - travel at a top speed of 45 miles per hour. Driving lessons in the armored vehicles are part of the normal training astronauts participate in when they come to KSC for countdown rehearsals.

Commander Covey and Pilot Culbertson spent part of today practicing landing a Gulfstream II jet at the Space Center's Shuttle Landing Facility. The Gulfstream simulates an Orbiter's powerless descent down to the Landing Facility. Also today, technicians in the Vehicle Assembly Building finished removing part of the fuel line from Columbia which is suspected of leaking. The part was shipped to its California manufacturer for testing and a replacement is being installed on Columbia's external tank, a task which should take approximately a week. [Halvorson, **FLORIDA TODAY**, p. 6A, June 20, 1990.]

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CHEMKO CLEANING, INC. CONTRACT

Chemko Cleaning, Inc. (Mims, FL) has been awarded a \$54,891 contract to fabricate breathing air and gaseous nitrogen handling and control equipment for use at Kennedy Space Center and Vandenberg Air Force Base, CA. Chemko will have eight months to complete the work on four pneumatic panels. Three of the panels will be used primarily to provide

and regulate the breathing air supplied in Self-Contained Atmospheric Protective Ensemble (SCAPE) equipment at the Orbiter Processing Facility (OPF) High Bay 3 now under construction, the Payload Hazardous Servicing Facility, and at Vandenberg. SCAPE suits are used for protection in hazardous atmospheric conditions. The fourth panel will regulate all supplies of gaseous nitrogen used in High Bay 3 of the OPF. KSC operates a launch site resident office at Vandenberg that serves to coordinate spacecraft requirements of other NASA centers and other government agencies, while working with the Air Force to arrange base support for all NASA operations at the installation. [Kristofferson, NASA NEWS RELEASE NO. 101-90, June 19, 1990.]

June 21: TITUSVILLE BANS ROCKET FUELS

In a 4-1 vote tonight, Titusville, FL's city council prohibited the use of hypergolic fuels by any firm, except the existing Astrotech Space Operations, a payload processing plant. Business that want to fuel satellites will have to locate outside the city. "There was a feeling among people that the council wasn't doing enough. We wanted to send a message that the safety of the people is first and foremost in our minds," said Councilman **Steve DeAngelo**. Council member **Terry Tolbert**, who cast the sole negative vote, said, "The decision to ban hypergolics was an emotional decision. We didn't have enough information to go on." The ban is most likely to impact businesses looking to relocate to the Central Brevard area. [Brown, FLORIDA TODAY, pp. 1B-2B, June 21, 1990.]

□ ASTRONAUTS JOIN PRACTICE COUNTDOWN

The STS-38 crew will be aboard Atlantis for the last three hours of the practice countdown for their July Department of Defense mission. Commander **Richard Covey**, Pilot **Frank Culbertson** and Mission Specialists **Charles "Sam" Gemar**, **Carl Meade** and **Robert Springer** will conduct several Shuttle systems tests while aboard the Orbiter. Springer said, "Everything is going so well it's unbelievable." The crew returns to Houston later today to continue training for the July 14 launch. [Halvorson, FLORIDA TODAY, p. 8A, June 21, 1990.]

□ ASTRONAUTS PRACTICE SHUTTLE ESCAPE

Five Shuttle astronauts practiced emergency egress from Launch Pad 39B today at the end of a two-day practice countdown at Kennedy Space Center. "The crew re-enacts what might happen if they were actually having an emergency during a launch countdown," said Space Center spokesman **Bruce Buckingham**. The major differences between this and an

actual countdown: the Shuttle was not fueled, and the astronauts did not ride the steel baskets down slide wires to the ground during their escape. Buckingham said, "There was no need for them to ride in the basket. They are perfectly safe. Getting from the Orbiter to the basket is the part they need to rehearse."

Atlantis Commander **Richard Covey**, Pilot **Frank Culbertson** and Mission Specialists **Charles "Sam" Gernar**, **Carl Meade** and **Robert Springer** were awakened at 6:05 a.m. today to eat a traditional pre-launch breakfast and don their partial-pressure spacesuits before riding to the launch pad about 7:45 a.m. Aboard Atlantis, the crew tested Shuttle systems and performed all tasks required on launch day. "The obvious purpose," said Buckingham, "is so the launch crew and the flight crew can experience the environment of a launch day without having to actually launch." Culbertson, Gernar and Meade will be making their first Shuttle flights. [Halvorson, *FLORIDA TODAY*, p. 5A, June 22, 1990.]

June 22:

CRRES DELAYED, AGAIN

Launch of the Combined Release and Radiation Effects Satellite aboard a General Dynamics Atlas has been postponed from July 9 to July 17. Problems were encountered this week during a practice countdown, according to officials. **James Womack**, Director of Expendable Vehicles at Kennedy Space Center, said an additional practice countdown would be held at Cape Canaveral Air Force Station's Launch Complex 36B. "While the test (this week) resulted in 99 percent of the launch vehicle data being obtained, some problems were encountered in the final automatic countdown," he said. "A decision was made to re-run the test to obtain additional data considered important." The NASA-Air Force spacecraft will test the effect of space radiation on advanced satellite electronics and will also study the magnetic and electric fields surrounding Earth. [Halvorson, *FLORIDA TODAY*, p. 8A, June 23, 1990.]

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ATLANTIS LEAK TEST

Whether Atlantis will launch on schedule in mid-July depends on the result of a leak test of the sort which led to the grounding of Columbia May 30. "We have plenty of work to keep us busy from now until launch next month, including the liquid hydrogen tanking test we have planned for next Thursday (July 5)," said **Jay Honeycutt**, Director of Shuttle Management and Operations, after a managerial review of pre-liftoff work. "We don't expect any leaks in the Atlantis vehicle. However, if the test identifies a problem, we will have to take the necessary steps to ensure the vehicle is safe to fly," he added. The special leak test had been planned for

next Wednesday (July 4) but was delayed one day because work in the Shuttle's rear engine compartment is taking longer than anticipated, said **Lisa Malone**, KSC spokeswoman. Managers are considering moving the target launch date from July 14 to July 15 because of the slowdown, she said. [Halvorson, **FLORIDA TODAY**, p. 8A, June 23, 1990, Brown, **FLORIDA TODAY**, p. 1A, June 25, 1990.]

June 23: **TITAN LAUNCHES INTELSAT 6**

Martin Marietta successfully launched its Commercial Titan and its INTELSAT 6 payload from Cape Canaveral Air Force Station's Launch Complex 40 this morning at 7:19. Twenty-five minutes after launch, ground controllers confirmed that the 29,452-pound INTELSAT 6 and its on-board solid rocket kick motor had separated from the second stage of the Titan 3. That was a confirmation that Martin Marietta failed to receive on the occasion of its March 14 INTELSAT mission. Referring to that failure today, **Ed Browne**, Martin Marietta Commercial Titan Inc. President, said, "All of us were sorry that it happened. It had a tendency to put a notch on our reputation, and we don't like that. But today was a good da, and a normal day. We expect all our future launches to be like this one." The next Commercial Titan launch from Complex 40 will be in September 1992; in the meantime, the launch pad will undergo refurbishment. [Banke, **FLORIDA TODAY**, p. 1A, June 24, 1990, Oates, **THE ORLANDO SENTINEL**, June 24, 1990.]

□ **ATLANTIS TAKES ON PROPELLANTS**

At 4 p.m. today Launch Complex 39B will be closed and the hazardous portion of loading propellants into Atlantis will begin and last through early on July 2, according to Kennedy Space Center spokeswoman **Lisa Malone**. Following the loading, will come a critical leak test ordered by NASA to make sure that a leak like the one that scrubbed a May 29 Columbia launch attempt does not exist, said Malone.

During the weekend, workers also searched for leaks in the plumbing of Atlantis' main propulsion system by pumping helium through the fuel lines. None had been found late Saturday. Workers also cleaned Atlantis' payload bay so the two 60-foot-long doors could be closed as a safety precaution during the scheduled hazardous operations. [Banke, **FLORIDA TODAY**, p. 6A, June 24, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-8, June 26, 1990.]

June 24:

MCDONNELL DOUGLAS SUED

Insurers who paid more than \$6 million to repair a multipurpose Indian satellite are suing McDonnell Douglas Corp., McDonnell Douglas Space Systems Co. and four employees involved in last year's launch-pad accident that damaged the spacecraft. The Insat-1D satellite was launched June 12 aboard a McDonnell Douglas Delta rocket - a year later than planned because of the accident. The suit, filed in Brevard Circuit Court, identifies the workers involved in the accident only as John Doe. The suit requests damages in excess of \$6 million, plus interest. ["McDonnell Douglas Sued for \$6 Million," **FLORIDA TODAY**, p.10E, June 24, 1990.]

June 25:

COLUMBIA GETS ENDEAVOUR PART

Columbia's astronomy mission has been delayed again because technicians have been unable to pinpoint the source of its fuel leak. Liftoff is now targeted at late August rather than mid-August. Further, NASA has decided to take a part from the newest Shuttle - still being built - the Endeavour; the part will replace Columbia's suspect hardware. The loan of a part is not expected to delay Endeavour's first mission which has been scheduled for 1992.

"There seems to be something different in the Orbiter side or the external tank side [of Columbia] that is causing it to leak and making it difficult to find. We may find something straightforward that is broken or something, but at this point we can't find anything wrong," said **David Winterhalter**, Director of Systems Engineering and Analysis at NASA Headquarters. Workers at Kennedy Space Center will remove the Orbiter side of the device this week for testing while NASA's only spare - the part on Endeavour - is sent on to the Space Center.

Deputy Shuttle Director **Brewster Shaw** said that KSC workers on June 28 will partially fill Atlantis' external tank with liquid hydrogen to test for a leak similar to that of Columbia. He said that engineers did not have to understand what happened with Columbia before allowing Atlantis to launch. "We just have what is probably going to turn out to be an isolated case with Columbia," Shaw said.

Servicing of the Broad Band X-Ray Telescope with liquid argon was completed yesterday. The servicing had been planned for today, however, pressure readings taken yesterday indicated lower levels than expected. Argon provides up to 16 days of cooling for the instrument. While in the OPF, some of Columbia's systems will require routine servicing. A functional test of the reaction control system regulators is planned this

week. [Banke, **FLORIDA TODAY**, p. 1A, June 26, 1990, **KSC SHUTTLE STATUS, STS-35 - COLUMBIA (OV 102)**, June 25, 1990.]

June 26: PLUTONIUM-POWERED PROBE SURVIVABLE

Thomas Akers, Mission Specialist for the Ulysses Planetary Probe Mission, said today that the probe would survive a Challenger-like accident and is safe to fly aboard Discovery (STS-41) in October. "We have looked at the statistics and the studies and our conclusion is that it's definitely as safe as it can be and we're not worried about it," Akers said. "The three people I think the most of - my wife and two kids - are going to be as close as anybody to the Shuttle" when it's launched, he said. NASA studies state the chance of a plutonium release during launch is 1 in 6 million and 1 in 4,200 during deployment. NASA Ulysses Project Manager **Willis Meeks** says that the worst case scenario is that an accident might cause about 300 to 400 additional cancer deaths in the world population of four billion people in the next 50 years. [Halvorson, **FLORIDA TODAY**, p. 4A, June 27, 1990.]

□ COLUMBIA PART ARRIVES JUNE 28

Endeavour's borrowed fuel line will arrive at Kennedy Space Center for installation in Columbia on June 28. NASA officials expressed confidence that the new fuel line will eliminate Columbia's leak. "We wouldn't ship it down here if it hadn't been through all the right tests and passed them," said KSC spokeswoman **Lisa Malone**.

"What we found out is that the problem is not on the tank side of the fuel line," said **Charles Harlan**, Director of Safety, Reliability and Quality Assurance at Johnson Space Center. "And I would tend to believe that shows the testing methods are adequate for identifying leaks on the tank side. I don't think anyone has proven that our test procedures are ineffective." **Brewster Shaw**, Deputy Director of Shuttle Operations at KSC added, "Maybe the other units are not so suspect after all."

The special test is aimed at eliminating possible sources of the leak. "There are still some unknowns. We don't know exactly where Columbia's leak was, and it doesn't cost a lot to do that tanking test so it's cheap insurance," Shaw said. Safety experts who oversee NASA's operations say moving Columbia back to the VAB was the right move. "We've always been telling NASA 'safety first and schedule second.' NASA is paying great attention to that or they would not have rolled Columbia back and postponed the flight," said **Gil Roth**, Staff Director of the Aerospace Safety

Advisory Panel. [Halvorson and Banke, **FLORIDA TODAY**, p. 4A, June 27, 1990.]

June 27:

MINOR ACCIDENT AT PAD

An accident occurred today at Launch Complex 39B when a technician stepped on a work platform in Atlantis' rear engine compartment, NASA officials said. Part of the platform collapsed and fell about 7 feet onto an empty line connected to a low-pressure fuel turbopump, causing a small dent in nickel plating surround the 4-inch-diameter line. No worker was injured, but work stopped on the launch pad for 2 1/2 hours while the line was inspected. Inspectors decided that the damage was minor and that the line will not have to be replaced. [Halvorson, **FLORIDA TODAY**, p. 4A, June 28, 1990.]

June 28:

LEAK TEST TODAY

Today, Atlantis undergoes a leak test which will determine whether the Orbiter has the same type of leak that postponed the launch of Columbia from May 30 until late August. The outcome of the test will impact the launch date decision now under consideration as NASA managers meet today and tomorrow in a Flight Readiness Review at Kennedy Space Center. Atlantis is tentatively scheduled to fly July 15, and a firm launch date is expected to be announced June 29. Today's test involves pumping about 200,000 gallons of liquid hydrogen into Atlantis' external fuel tank and main propulsion system. If Atlantis has the same type of leak, the Orbiter will be rolled back and its Department of Defense mission would be delayed a month, at least. [Halvorson, **FLORIDA TODAY**, p. 4A, June 28, 1990, Halvorson, **FLORIDA TODAY**, p. 8A, June 29, 1990, "Tank-Filling Test Set for Shuttle," **THE ORLANDO SENTINEL**, June 29, 1990, Malone, **NASA NEWS RELEASE NO. 118-90**, June 27, 1990.]

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COSTELLO & SONS CONTRACT

Costello & Sons Corp. (Merritt Island, FL) has been awarded a \$156,000 contract to construct office space in the Engineering Development Laboratory (EDL) at Kennedy Space Center. Under the fixed price contract, the firm will have 90 days to complete the work. This effort will include the installation of a second-story platform in the facility's high bay that will serve as flooring for the elevated 2,700-square-foot office space. The EDL is presently used to house engineering research laboratories for the Space Shuttle Program. It also is a tour stop for Spaceport USA that displays Apollo program equipment and provides a simulation of a lunar landing. During the Apollo Program, this structure served as the Flight

Crew Training Building. Apollo astronauts used simulators in the building to rehearse for the first manned landing on the moon and other lunar missions. [Kristofferson, NASA NEWS RELEASE NO. 114-90;, June 28, 1990.]

June 29:

SHUTTLE FLEET GROUNDED

Atlantis, Columbia and Discovery have been grounded by NASA. "There is no question that we will not fly until we understand the problem and have it fixed," said William Lenoir, NASA's Associate Administrator for Space Flight. The problem Lenoir referred to is that of the hydrogen leak found in both Atlantis and Columbia. The ripple effect of delays could extend to 1993 when NASA is hoping to send a crew of Shuttle astronauts into space to repair the Hubble Space Telescope. Lenoir said that if the leaks could not be fixed within a month, one of the two missions preceding the Ulysses flight would have to be postponed. "If it costs us a flight, that's a shame, but that's what it will take," Lenoir said. [Halvorson, FLORIDA TODAY, pp. 1A & 4A, June 30, 1990, Glisch, THE ORLANDO SENTINEL, p. A-1, June 30, 1990.]

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MCCARTNEY LEAK STATEMENT

"During a tanking test of Atlantis this morning, a hydrogen leak was found in the area of the 17" disconnect. The launch team here at KSC is reviewing data from the tanking test and will examine the area of this leak as soon as the fuel is drained and the area is safe for access. Obviously, we will not fly until we understand this leak and the one in the Columbia system.

"Working these problems will keep our crews extremely busy, but I am confident we will uncover and correct the problem shortly. To do this, we will probably have to return Atlantis to the VAB which means we will postpone the launch a minimum of two weeks. Depending on what the problem turns out to be, the delay could be longer, but I am not anticipating a long-term shutdown.

"I appreciate the willingness of the government/contractor team to put forth an extra effort to solve this problem. The extensive testing that we do is designed to uncover problem areas. I expect this one will be solved shortly and we will resume our scheduled processing activities." ["Statement from Center Director Forrest McCartney," June 29, 1990.]

June 30:

LEAK CHECKS EXTENDED

The search for the source of leaks in Columbia and Atlantis will extend across the country with tests at Kennedy Space Center and in a laboratory in California. "Working these problems will keep our crews extremely busy, but I am confident we will uncover and correct the problems shortly," said KSC Director Forrest S. McCartney. Cecil Houston, Marshall Space Flight Center Resident Manager said, "It's puzzling us all. There must be something different because it leaks, but you know it is so subtle that it doesn't leap out at anybody and folks have been looking hard to find it."

The tank side of Columbia's fuel line recently passed leak tests in California at Rockwell International's laboratory. This week, the same lab will test the part of the line that runs through Columbia's belly to the Shuttle's main engines. Meanwhile, technicians at Kennedy Space Center will pump helium through Atlantis' main propulsion system to attempt to isolate that Orbiter's leak. [Halvorson, FLORIDA TODAY, July 1, 1990, Sawyer, THE WASHINGTON POST, p. A1, June 30, 1990.]

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COLUMBIA PART CALIFORNIA-BOUND

The Space Shuttle Columbia's suspect fuel valve has been shipped to California for a critical test to be performed this week. Rockwell engineers will take the valve to a special laboratory and pump supercold hydrogen through it to try to pinpoint the leak which ground the Shuttle on May 29. The test could begin as soon as the Fourth of July and will take two days to complete, according to Janet Dean, Rockwell International spokeswoman. [Glisch, THE ORLANDO SENTINEL, July 1, 1990.]

JULY

July 2: HUBBLE INVESTIGATION BOARD NAMED

Dr. Lennard A. Fisk, NASA Associate Administrator for Space Science and Applications today appointed a Hubble Space Telescope Optical Systems Board of Investigation to review, analyze and evaluate the facts and circumstances regarding the manufacture, development and testing of the Hubble Space Telescope Assembly. Dr. Lew Allen, Director at the Jet Propulsion Laboratory, will chair the investigation; the other members of the board are: Charles P. Spoelhof, George A. Rodney, John D. Mangus, Dr. R. (Bob) Shannon, Dr. Roger Angel, and Public Affairs Advisor Sarah Keegan and Counsel Gary Tesch. [Keegan, NASA NEWS RELEASE NO. 90-091, July 2, 1990.]

□ LH² LEAK INVESTIGATION

"During the launch attempt for the STS-35 mission on May 29, 1990, a hydrogen leak, in excess of limits established to maintain safe operating conditions, was detected by onboard hazardous gas detection systems. Leakage was detected both in the aft compartment and external to the liquid hydrogen external tank/orbiter umbilical assembly.

"A subsequent tanking test, that incorporated special ground instrumentation, further isolated the leak to the free space between the two halves of the umbilical assembly. The umbilical provides capability to load propellant into the external tank and transfer propellant from the external tank to the Space Shuttle main engines during launch. The umbilical disconnect assembly is the separation point between the Orbiter and the external tank after main engine cutoff.

"The design of the umbilical disconnect has remained the same throughout the Shuttle flight program except that a safety modification to incorporate a valve latch, which precludes inadvertent closure, was authorized after the Challenger accident. Data from the tanking test determined that the design changes incorporated by the modification did not contribute to the leakage.

"Following rollback and Orbiter demate, the LH² External Tank (ET) side of the umbilical was removed and tested at Rockwell International (Downey, CA). The testing was performed under precisely controlled liquid hydrogen test conditions. No leaks were detected.

"On June 29, 1990, NASA conducted a modified propellant loading test of the STS-38 Space Shuttle vehicle to ensure the safety and integrity of the

Orbiter/ET umbilical. The test revealed a hydrogen leak. The results indicate the leak is in the vicinity of the umbilical mating plates. It appears to be primarily from the 17-inch line but possibly with a contribution from the 4-inch line. The leak is flow rate and temperature dependent. It is not as high as STS-35 but it exhibits many of the same characteristics.

"An extensive investigation is being performed to isolate the source of the leakage observed on both the STS-35 and STS-38....In the interest of safety, all potential leak sources, including the very low probability of a parent metal flaw, are being investigated. A detailed investigation of all aspects of the STS-35 and STS-38 component history, including acceptance test procedure requirements and data, and design changes being performed.

"Processing of the STS-38 vehicle has been suspended. Engineers are continuing troubleshooting efforts on the Shuttle vehicle at Launch Pad 39-A. Today, the external tank will be pressurized and leak checks conducted in the area of the Orbiter-to-external tank umbilical. Another special tanking test is being considered using special leak detection sensors to help pinpoint the leak's location....

"Until the leak investigation is completed, Shuttle flights have been suspended. Returning the Shuttle fleet to flight status is the highest priority in the Space Flight Office, and every available resource within the Shuttle program is being brought to bear on solving this problem. NASA is confident that the source of the leak can be isolated quickly and the problem fixed with minimum disruption to the Shuttle flight program.

"Independent of these events, a component redesign to replace the current umbilical disconnect with a new design has been underway and is well into the preliminary design phase. The new disconnect incorporates safety improvements, including redundant seals at all locations. [Hess, NASA FACT SHEET, July 2, 1990, Banke, FLORIDA TODAY, July 3, 1990, Banke, FLORIDA TODAY, p. 4A, July 4, 1990, Higginbotham, FLORIDA TODAY, p. 1A, July 5, 1990.]

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NEW ENTRANCE AT SPACEPORT USA

A new, permanent entrance has gone into use at Kennedy Space Center's Spaceport USA that affects all visitors, auto and motorcoach alike. The new entrance was made necessary by construction of the new Astronauts Memorial. In addition to construction on the Memorial, work continues at the attraction on the \$1 million expansion of Spaceport Central, the main visitor information building. When completed in mid-August, 1990, Spaceport Central will house a new 50-seat presentation theater, an

outdoor covered atrium area and new food service windows featuring ice cream and yogurt. ["New Entrance Open at Kennedy Space Center Spaceport USA," **Spaceport USA Press Release**, July 2, 1990.]

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WORKERS REPAIR SHUTTLE DOOR

A cracked part on Discovery's payload bay door, damaged during a worker's fall last week, was repaired by Kennedy Space Center workers today. A Lockheed Space Operations Co. quality control worker had crawled across a padded board to reach the area, when he lost his balance and fell onto the open 60-foot-long door. The worker, who was not injured, was making a routine inspection of the Orbiter.

The damage was minor and unrelated to a an accident on June 4 in the Orbiter Processing Facility, said KSC spokeswoman **Lisa Malone**. In that accident, an overhead bridge crane accidentally snagged the cargo bay door, bending one corner of the door upward several feet. The door apparently was not damaged and an accident investigation report is expected shortly, according to Malone. ["Workers Repair Shuttle Door," **FLORIDA TODAY**, p. 2A, July 3, 1990.]

July 3:

CHILLWATER OUTAGE BOARD REPORT

Placement of splash guards over the Motor Control Centers in the Utility Annex at Launch Complex 39, replacement of piping, and changes in procedures are among 24 recommendations made by the Mishap Investigation Board probing an accident April 2 which stopped Space Shuttle processing for 10 hours. Estimated cost of immediate repairs and recycling was \$75,000.

The Board was chaired by **John E. Meyer**, Chief of the Facilities Engineering Directorate's Electrical Branch. Other members of the investigation board included **Howard S. Meeks**, Payload Operations, Ground Systems Engineering Branch; **Thomas N. Williams**, Vehicle Engineering, Electrical and Telecommunications System Division; and **Robert C. Koning**, Center Support Operations, Mechanical and Electrical Systems Branch. Ex-Officio Board members included **Shirley Isles**, Safety Advisor; **Douglas Hendriksen**, Legal Advisor, and **Bruce Buckingham**, Public Affairs. [Young, **NASA NEWS RELEASE NO. 123-60**, July 3, 1990.]

July 6:

ENDEAVOUR POWERED-ON

The new Space Shuttle Endeavour was powered-on for the first time today at Rockwell International Corp.'s Orbiter Assembly Facility (Palmdale, CA),

ten (10) days ahead of schedule. The start of power-on testing marks the beginning of an eight-month test period for Endeavour, the fifth operational Orbiter built by Rockwell's Space Systems Division (SSD) for NASA's Space Shuttle program. During the next three months, Endeavour's on-board electrical systems will be functionally energized to verify that the vehicle's instrumentation is operational and that vehicle systems are performing to engineering specifications.

Major structural components remaining to be mated to the vehicle include its body flap in July; vertical stabilizer, payload bay doors, and elevons in August; and forward reaction control system module in November. Endeavour's orbital maneuvering system pods will be installed at Kennedy Space Center. [Hess, Campion and Herring, NASA NEWS RELEASE NO. 90-95, July 6, 1990, Banke, "Power Test Marks Milestone In Endeavour Construction," FLORIDA TODAY, p. 5A, July 7, 1990.]

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MISALIGNMENT DID NOT CAUSE LEAKS

NASA today ruled out misalignment as a cause of the leaks which have plagued both Columbia and Atlantis. "We have analyzed that and reanalyzed that and we cannot make that come even close to giving us anything that would be suspicious," said William Lenoir, Associate Administrator for Space Flight. He said, further, that the external tanks could be ten times more crooked than they in fact are and still not cause a leak. NASA now considers the prime suspect to be a 17-inch-wide pipeline that funnels fuel from the external tank to the Orbiter's main engines. [Halvorson, FLORIDA TODAY, p. 8A, July 7, 1990, Glisch, THE ORLANDO SENTINEL, July 7, 1990.]

July 7:

ATLANTIS LEAK TEST PLANNED

This week at Kennedy Space Center, Atlantis will undergo a leak test in which rocket fuel is pumped into the main propulsion system at 4,800 gallons per minute. It is designed to duplicate and isolate the type of liquid hydrogen leaks which have kept both Columbia and Atlantis grounded. NASA spokesman Ed Campion said, "We're setting up a very elaborate test. We want to make this the most complete test we can set up so that we can pinpoint the leak and quantify the amount of liquid hydrogen that is leaking." Associate Administrator for Space Flight William Lenoir said, "If we get through all of that [the testing] and we haven't found the leak, then in all honesty, I'm not sure where we go from there. That's a tough one. Maybe we'll all go on vacation." [Higginbotham, FLORIDA TODAY, pp. 1A-2A, July 5, 1990, Halvorson,

FLORIDA TODAY, p. 10A, July 8, 1990, SEE ALSO: Banke, "Bolts, Pipes Link Orbiter to Fuel Tank," FLORIDA TODAY, p. 5A, July 7, 1990.]

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U.S. PAYLOADS ON RUSSIAN ROCKETS

U. S. commercial payloads will be allowed to be launched on Soviet rockets for the first time, according to government and industry officials today. An Australian company known as Cape York Space Society will now be allowed to hire United Technologies Corp. to run a base in northern Australia from which Soviet rockets will carry satellites for pay for customers from around the world, perhaps as soon as 1995. Domestic rocket companies opposed letting the Soviet Union provide launching services for U. S. customers, but satellite makers favored opening up the market. The decision to approve the Cape York project was one of the thorniest issues resolved by the National Space Council headed by Vice President Dan Quayle. [Halvorson, FLORIDA TODAY, p. 2A, July 8, 1990, "Soviet Rockets Soon Could Launch U. S. Payloads," FLORIDA TODAY, pp. 1A-2A, July 8, 1990.]

July 8:

ASTP CREW REUNION SET

Kennedy Space Center will host a reunion of the astronauts and cosmonauts who flew the joint Apollo-Soyuz Test Project in 1975. Former cosmonauts Aleksey Leonov and Valery Kubasov will reunite with astronauts Tom Stafford and Deke Slayton this month to celebrate the historic flight. ASTP crew member Vance Brand will also attend if Shuttle training does not interfere. The astronauts and cosmonauts will arrive at Patrick Air Force Base July 25 and will tour KSC Space Shuttle facilities July 26 and take part in a news conference. The group will tour Spaceport USA's Gallery of Spaceflight and narrate a film of their mission at the Galaxy Theater; the latter event will be open to the public. In the evening the astronauts and cosmonauts will attend a reception hosted by the U. S. Astronauts Hall of Fame and depart Patrick Air Force Base on July 27. [Halvorson, FLORIDA TODAY, p. 10E, July 8, 1990.]

July 9:

NASA MANAGERS MEET

The results from the latest round of leak tests will be revealed today at a 3:00 p.m. meeting of NASA managers. "They just haven't had time to analyze the data yet," said NASA spokesman Mark Hess, following a weekend of tests in California. "They did see some leakage, but you can't look at the amounts they've got and draw any conclusions." NASA's Shuttle Program Director Robert Crippen and Associate Administrator for

Space Flight **William Lenoir** will discuss test results today in a briefing in Washington, D. C.

Tests in California with room temperature helium failed to duplicate the leaks. Even if the weekend test results isolated the problem, NASA would not necessarily end its investigation, said Hess. Kennedy Space Center engineers plan to pump rocket fuel through Atlantis' systems July 13, and investigators might wait for those results before ending the investigation of Columbia, he said. [Higginbotham, **FLORIDA TODAY**, p. 1A, July 9, 1990.]

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LEAK SUSPECT: TEFLON SEAL

NASA said today that it considers a Teflon seal a primary suspect for causing the liquid hydrogen leaks which grounded the Shuttle fleet. Associate Administrator for Space Flight **William Lenoir** said that although the space agency is closer to understanding the fuel leaks, only one of two planned flights might be launched before the scheduled October Ulysses mission launch. "We have not yet given up the ghost on two flights before Ulysses, but being frank and honest, it's extremely unlikely at this point that we would get two flights off," Lenoir said. **Robert Crippen**, Shuttle Program Director, said that the Shuttles could be leaking for different reasons. "We don't really know what we are dealing with, or when we can fly again," Crippen said. Further search for the sources of the leaks will continue July 13 or 14 when another test will be conducted on Atlantis at Kennedy Space Center's Launch Pad 39A. [Banke, **FLORIDA TODAY**, pp. 1A-2A, July 3, 1990, Glisch, **THE ORLANDO SENTINEL**, July 10, 1990, Halvorson, **FLORIDA TODAY**, p. 1A, July 10, 1990, "Shuttle Leak Still Eludes Engineers," **THE MIAMI HERALD**, p. 4A, July 10, 1990.]

July 10:

NASA TESTING

At a U. S. Senate committee hearing, U. S. Senator **Albert Gore** (D-TN) said, "I think it's not just a technological issue. It's a philosophical issue." He noted the problems NASA has had recently with the Hubble Space Telescope and leaky fuel lines which have grounded the Shuttle fleet and complained that NASA's "mindset" led to the failure to test. Gore said, "The common denominator, in my view, is inadequate testing."

NASA Deputy Administrator **J. R. Thompson** and Chief Scientist **Lennard Fisk** said the need for testing had not been obvious when Hubble was assembled. Thompson denied that NASA has an anti-testing philosophy and said the hydrogen gas leaks detected on Columbia and Atlantis shows the agency's concern for testing and safety. Thompson also said, "In

retrospect, there were tests we could have done and should have done. We weren't clever enough." NASA's Associate Administrator for Space Flight **William Lenoir** said some progress has been made in finding the source of the leaks, but conclusive results are probably two weeks away.

Meanwhile, at Kennedy Space Center workers continued to install special sensors and other equipment for July 13's leak test on Atlantis. [Crawford, **THE ORLANDO SENTINEL**, pp. A-1 & A-5, July 11, 1990, Lunner, **FLORIDA TODAY**, p. 2A, July 11, 1990.]

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I-NET, INC. WINS CONTRACT

Kennedy Space Center has awarded a \$689,625 contract to I-Net, Inc. (Bethesda, MD) to install fiber-optic cable at KSC. The small business firm will install an additional 144 fibers between two main communications switching centers, the Vehicle Assembly Building Repeater (VABR) in the Launch Complex 39 Area and the Communication Distribution and Switching Center (CDSC) in the KSC Industrial Area. The new cable will increase the KSC communications systems capacity and expand the several miles of fiber-optic cable that have already been installed at the 140,000-acre space center. Most facilities at the space center will eventually be linked by fiber optic cable which carries digitized communications data at a much higher rate than in-place X-band copper wire and provides more capabilities, including the transmission of video images, than the old system. It will also allow high-speed computers to relay orbiter and payload status data rapidly from processing areas and the launch pads to the Launch Control Center. [Kristofferson, **NASA NEWS RELEASE NO. 120-90**, July 10, 1990.]

July 11:

PIONEER MEDARIS: DEAD AT 87

Major General **John Bruce Medaris**, who was known as the Father of America's Space Program, died of bone cancer today at his home in Highland, NC. Medaris directed the launch of Explorer 1 in January 1958. He served in the military for 42 years in both the Marines and the Army, where he became a general in 1955. He commanded the Army Ballistic Missiles Agency (Huntsville, AL) from 1956 to 1960 and left the military in 1969 to become an Episcopal priest in Maitland, Florida. Medaris later joined the Anglican-Catholic Church and retired to North Carolina. During his retirement he continued to advise the federal government on Strategic Defense Initiative technologies. Much of Medaris' space memorabilia has been donated to the Evans Library at Florida Institute of Technology (Melbourne, FL). Medaris, who is survived by his wife Frances, will be buried at Arlington National Cemetery in Virginia. [Jean,

THE ORLANDO SENTINEL, pp. A-1 & A-6, July 14, 1990, Kayne, FLORIDA TODAY, p. 3A, July 12, 1990.]

July 12: FLORIDA INVESTIGATES PIPE INSTALLATION

Florida's Department of Environmental Regulation will investigate whether NASA complied with federal and state rules that call for independent inspections when installing new tanks, according to DER spokesman Mike Camardese. He said, "They are not allowed to do the inspections in house. That is a definite no-no. They have to get someone who is a certified professional engineer from outside the NASA family to certify the piping."

Records obtained by FLORIDA TODAY show that the pipes, which funnel hazardous fuel spills into underground holding tanks, were not tested and inspected according to KSC contract specifications. They were installed at a building where toxic chemicals are used to fuel satellites. Jim Towles, Director of Facilities Engineering, said the piping system was inspected by NASA and contractor engineers prior to installation at the Vertical Processing Facility. The pipes may have to be dug up on an order of DER so an independent engineer can inspect them. Lesser penalties would require KSC to establish certain environmental programs. [Halvorson, FLORIDA TODAY, pp. 1A-2A, July 12, 1990, Halvorson, FLORIDA TODAY, p. 1A, July 13, 1990.]

□ ATLAS DELAYED: ELECTRONICS TROUBLE

The launch of General Dynamics Corp.'s Atlas rocket will be delayed at least a week because of problems with spacecraft electronics aboard the Combined Release and Radiation Effects Satellite. One of the satellite's decoder units, which receive signals from ground controllers and order the craft's components and science instruments to work, did not operate properly during final pre-launch testing today. "While we suspect the unit itself, there may be things contributing to this on the pad that we don't understand," said Kennedy Space Center spokesman George Diller. [Banke, FLORIDA TODAY, p. 11A, July 13, 1990, Oates, THE ORLANDO SENTINEL, July 13, 1990.]

□ AIR FORCE MUSEUM OPENS

After seven years, the Air Force Space Museum at Cape Canaveral Air Force Station will reopen to the public on July 15. Because it is located within a restricted portion of the Eastern Space and Missile Center, the Museum has usually been closed to civilians because of security concerns. The Museum is at Launch Complex 26, where the first U. S. satellite -

Explorer 1 - was launched from Pad A. The complex itself is part of Cape Canaveral Air Force Station. The grounds include the site where **Alan Shepard** and **Virgil "Gus" Grissom** were launched in the Mercury Program and in the nearby blockhouse control room, electronic equipment has been restored. The Museum - National Historic Landmark - is free but visitors are required to stop at the Air Force Station Pass and ID Gate and to obtain a car pass. [Minor, **THE ORLANDO SENTINEL**, July 13, 1990.]

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OLSON ELECTRIC COMPANY CONTRACT

The Olson Electric Company, Inc. (Holly Hill, FL) has been awarded a \$236,437 contract at Kennedy Space Center to upgrade the fire detection and reporting system in the solid rocket booster Rotation Processing and Surge Facility (RPSF) Area. Olson will upgrade the fire detection and reporting systems in four of the seven buildings in the RPSF Area where solid rocket booster elements are inspected, processed and stored until being transferred to the Vehicle Assembly Building for integration into flight ready sets. [Kristofferson, **NASA NEWS RELEASE NO. 128-90**, July 12, 1990.]

July 13:

LEAKS SOURCES DIFFERENT

Two entirely different problems are to blame for the hydrogen fuel leaks on Columbia and Atlantis and, said NASA, the leaks should be relatively simple to fix. Associate Administrator for Space Flight **William Lenoir** said that tests performed today on Atlantis and on the fueling assembly of Columbia indicated that their leaks were in different places. The nature of the leaks supports the belief that there is no generic problem in the design of the Shuttle fuel lines, according to Lenoir. He said, further, that NASA's engineers would assess the impact of the leaking seals and how they should be repaired and should know early next week when Shuttle flights might resume.

NASA remained optimistic about the prospect of making at least one flight before October's Ulysses mission, which must occur then or face a two-year wait for another chance. If Atlantis's leak can be repaired on the launch pad, Lenoir said, it and its military cargo will probably fly first because Atlantis is needed to orbit an important astronomical observatory later in the year. [Banke, **FLORIDA TODAY**, p. 1A, July 13, 1990, Leary, **THE NEW YORK TIMES**, p. 9, July 14, 1990, Banke and Lunner, **FLORIDA TODAY**, pp. 1A-2A, July 14, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-6, July 14, 1990.]

July 14:

KSC AWAITS ATLANTIS REPAIR DECISION

Lisa Malone, spokeswoman for Kennedy Space Center, said today that workers "will be waiting for some direction from managers whether there needs to be any further testing at the launch pad or if preparations should begin to move Atlantis back to the Vehicle Assembly Building for some kind of repairs."

Today, workers moved the Shuttle's Rotating Service Structure in place around the Orbiter about 9:45 a.m. They completed removing all traces of liquid hydrogen from the Orbiter's plumbing by filling the lines with harmless gases about 11:30 a.m. They also gained access to the Shuttle's rear engine compartment. [Banke, **FLORIDA TODAY**, p. 5A, July 15, 1990.]

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NEW ROOF FOR O & C BUILDING

Hamilton Roofing Inc. (Palm Bay, FL) won a \$430,097 contract to begin replacing the twenty-year-old roof atop Kennedy Space Center's Operations and Checkout Building. The work, to be done in three parts, is scheduled to be completed in 1993; contracts for the remaining work have not yet been awarded. The O & C Building houses offices, laboratories, astronaut crew quarters and satellite assembly areas. Horizontal payloads such as Spacelab are prepared for launch in the building before being installed in Shuttle cargo bays at the Orbiter Processing Facility. ["Firm to Replace Roof at KSC," **FLORIDA TODAY**, p. 10E, July 15, 1990, Kristofferson, **NASA NEWS RELEASE NO. 124-90**, July 5, 1990.]

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KSC RIFLE RANGE CONCERNS

Members of the North Merritt Island Homeowners Association have expressed concern about plans by the Spaceport Gun Club to construct a rifle range in a remote area of KARS Park off Hall Road. Association President **Bob Crisafulli** said, "It is really needed and, if it's built properly, we're not necessarily opposed to it. We just want to make sure everything is done correctly with safety in mind." Spaceport Gun Club President **Bob Goforth** said it probably would be about six months before approvals are gathered prior to construction of the combination pistol and rifle range. "We still have got specific design plans," said Goforth, "but we want to make sure we line everything up correctly and do it safely." Still needed is a survey for endangered scrub jays by the U. S. Fish and Wildlife Service and approval by Kennedy Space Center Director **Forrest**

McCartney, Goforth said. [White, **FLORIDA TODAY**, p. 3B, July 15, 1990.]

July 16: QUAYLE TO NASA: KNOW THYSELF

Vice President **Dan Quayle** directed NASA to form an outside task force to consider the direction of the nation's space program. "There is no White House investigation of NASA," Quayle said. "Space continues to be a top priority for this administration. We all want the best ideas on how we can move into the next century maintaining our leadership in space."

Richard Truly, NASA Administrator, said, "I am pleased the Vice President has expressed his confidence in NASA, as he has many times in the past. NASA will continue to work closely with the Space Council [headed by Quayle] in pursuit of the president's remarkable vision for America's space destiny. I am confident the Shuttle will be flying again soon and that timely corrections to the Hubble Space Telescope will assure realization of its full potential." **Louis Friedman**, Executive Director of the Planetary Society (Pasadena, CA) called Quayle's decision to bring in voices outside NASA "a very good idea."

Speaking on Public Television's MacNeil/Lehrer NewsHour, Administrator Truly said he planned to appoint about ten "really credible" representatives from the government and industry. "We'll tell them what NASA is doing today, describe what our plans are for the future and get their experience on where they think we ought to go," Truly said. Expected to testify soon before Senator **Barbara Mikulski's** (D-MD) committee are Associate Administrator for Space Flight **William Lenoir**; scientist Dr. **Lennard Fisk** and former NASA Administrator **James Beggs**. ["Administrator Truly's Response to the Vice President's Statement," **KSC Dome**, July 16, 1990, Lunner, **FLORIDA TODAY**, p. 1A, July 17, 1990, Hoversten and Lunner, **USA TODAY**, p. 3A, July 17, 1990.]

□ ATLAS LAUNCH: JULY 20

NASA said today that the first commercial launch of an Atlas rocket could be as soon as July 20. The space agency believes it has resolved a problem with a spacecraft unit that sends and receives computer commands. Officials think the problem lies with ground support equipment and radio signal interference around Cape Canaveral Air Force Station. Weekend tests of the equipment were successful. "We sent more than 10,000 commands to the [Air Force scientific satellite] with no errors," said NASA spokesman **George Diller**. The satellite is designed to study the effect of

space on advanced satellite electronics and the magnetic and electric fields around Earth.

At Kennedy Space Center today, engineers continued to analyze data gathered during a special test on Atlantis at the launch pad July 13. The test involved pumping liquid hydrogen into the Orbiter's external fuel tank in order to understand the leaks which have grounded Atlantis. The test results will be the primary topic at a briefing today. [Halvorson, **FLORIDA TODAY**, p. 2A, July 17, 1990.]

July 17:

AUGUST: RETURN TO FLIGHT

"We're going back to flight," predicted Associate Administrator for Space Flight **William Lenoir**, who added a cautionary note, "It requires some luck on our part." Atlantis could lift off by August 10 if repairs and tests planned for next week clear the vehicle. Lenoir said NASA is "very optimistic" that at least one Orbiter can fly before October's Ulysses mission and said he had a "glimmer of hope" that leaks on Columbia and Atlantis can be fixed so both can be launched.

NASA Administrator **Richard Truly** appeared on ABC's "Good Morning America" program and said, "We were afraid that we had what we call a generic problem, something we had overlooked that might really be a dangerous situation that would have a long-term effect. As it turned out, it was just the terrible coincidence of two separate, specific leaks. The system didn't go down for three years like it did after Challenger, it went down for three or four weeks."

At a Washington news conference, **President Bush** expressed strong support for Truly's handling of the recent NASA problems: "I have confidence in NASA. I have great confidence in Dick Truly. It's a perilous business, I guess, anytime you put people up there into space, but the record has been very good. I want to see us continue to be the leaders in space." [Lunner, **FLORIDA TODAY**, p. 1A, July 18, 1990, "Bush Gives NASA Vote of Confidence," **USA TODAY**, p. 3A, July 18, 1990, "Shuttle Flights to Resume by September, NASA Says," **THE MIAMI HERALD**, p. 10A, July 17, 1990.]

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ATLANTIS TEST PREPARATIONS

Launch pad technicians are preparing to repeat a test to determine whether Atlantis has to be rolled back to the Vehicle Assembly Building; the re-test could come as early as July 25, according to **William Lenoir**, Associate Administrator for Space Flight. "In all honesty," he said, "we do not expect

what we can do on the pad will fix the problem." Following the July 20 hydrogen leak test, workers will inspect for problems in welds near the joint between the external tank's main 17-inch-wide fuel line and the pipe that connects the tank to the Orbiter's plumbing.

Workers also plan to inspect 48 small bolts surrounding the joint to make sure they are as tightly attached as they should be. If no leaks develop during the test, Atlantis could be cleared for a mid-August liftoff. Otherwise, workers will have to prepare the Orbiter for a rollback.

Today, workers measured how well hydrogen gas sensors worked during the July 13 Atlantis test so that adjustments may be made for the July 25 test. Technicians also prepared to replace one of three auxiliary power units on Atlantis. The APU supplies power to pressurize the Orbiter's hydraulic systems used in flight. [Banke, **FLORIDA TODAY**, p. 6A, July 18, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-5, July 18, 1990.]

July 18:

ATLAS LAUNCH RESCHEDULED

General Dynamics Corp.'s first commercial Atlas rocket is now scheduled to launch from Cape Canaveral Air Force Station July 20 at 3:33 p.m. The launch had been delayed so a computer problem in the Combined Release and Radiation Effects Satellite could be worked to resolution. Technicians concluded the problem with the satellite's command-decoder unit stemmed from outside radio-signal interference and slight distortions from the test equipment. [Oates, **FLORIDA TODAY**, p. A-13, July 19, 1990.]

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DISCOVERY THRUSTER DAMAGED

One of 44 thrusters which steer Discovery in space was damaged when it fell from a work platform late today. It will be replaced with a spare. Spokeswoman **Lisa Malone** said, "One of two clamps slipped and caused the structure the thruster was mounted on to fall to a work platform below, damaging the thruster." The only visible damage was an impression in the thruster's metal about 3 inches long, a half-inch wide and a quarter-inch deep. Inspections continue and it was not decided whether to form a NASA investigation board. [Banke, **FLORIDA TODAY**, p. 2A, July 20, 1990.]

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OVERTIME LEVELS QUESTIONED

An examination of KSC records reveals: Kennedy Space Center has granted exceptions to its strict overtime regulations 2,500 times this year; Almost half the 1990 waivers have come during the weeks when Shuttle launches and landings occurred. Experts have questioned whether the

large amount of overtime might have contributed to fuel leaks which have grounded the Shuttle fleet.

Bob Sieck, Shuttle Launch Director, said that KSC is handling overtime better than in the past and that worker fatigue is not a problem. "We have not found fatigue to be a factor in any of the incidents that have occurred in the past," he said. "When we have an incident, overtime is the first thing we accumulate data on - the number of hours the person or all the people involved have worked prior to that event on that shift, that week, that month."

"I can't envision this place working with zero percent overtime, it would be impractical to completely eliminate the practice," Sieck said. "If that were the case, too much of the workforce would be idle. If you had a standing army of people for every job that we did around here, to cover every contingency, the workforce would be exorbitant. It makes sense to use overtime to carry you through peak periods of activity." [Higginbotham, **FLORIDA TODAY**, pp. 1A-2A, July 20, 1990.]

July 20: **ATLAS LIFTOFF DELAYED: LEAK**

The scheduled launch of an Atlas rocket was delayed today due to a leak which prevented the start of a compressor which furnishes gaseous nitrogen to the rocket to keep its satellite payload cool. Workers were able to start the compressor in time for a second launch attempt, but a leak in a liquid helium line then began overchilling hydrazine and the launch was called off just before 4 p.m. "We believe we understand what the problem is, but it will be at least Sunday before we try again," said **Jack Isabel**, spokesman for General Dynamics. He said, further, that engineers will continue to assess the problem. [Banke, **FLORIDA TODAY**, p. 6A, July 21, 1990, "Chemical Leak Prompts Delay in Atlas Liftoff," **THE MIAMI HERALD**, p. 3A, July 21, 1990, Oates, **THE ORLANDO SENTINEL**, p. A-6, July 21, 1990.]

□ **SHUTTLE THRUSTER MOTOR DAMAGE SLIGHT**

"The good news is that we can repair that thruster," announced **Lisa Malone**, Kennedy Space Center spokeswoman about the damage to a \$600,000 Shuttle steering thruster which fell off a platform in a maintenance facility. Workers were inspecting the thruster's plumbing for leaks when a clamp holding the rocket engine to its work stand slipped, causing the thruster to fall. It will be replaced by a spare. Today, workers will complete the installation of a new auxiliary power unit in Atlantis at Launch Pad 39A. [Banke, **FLORIDA TODAY**, p. 6A, July 21, 1990,

"Another Shuttle Has a Problem - Atlantis Worked On," **THE ORLANDO SENTINEL**, p. A-6, July 21, 1990.]

July 21: ATLAS 1 REPAIRED, READY

"We are go for launch," said **Jim Codd**, a General Dynamics Manager, speaking of his company's Atlas 1 launch vehicle. The rocket has had its leaking liquid helium line repaired and should be ready to launch July 22 between 3:28 and 3:41 p.m. or between 4:43 or 4:54 p.m. Kennedy Space Center spokesman **Bruce Buckingham** said that the satellite aboard the Atlas was not affected by the leaking helium and remains ready for launch. The Atlas payload is a joint NASA-Air Force science probe which will study the magnetic and electric fields surrounding Earth and the effects of space radiation on electronics. [Banke, **FLORIDA TODAY**, p. 1A, July 22, 1990.]

□ ATLANTIS: ANOTHER LEAK TEST

Atlantis will undergo another liquid hydrogen leak test tomorrow. "Everything still looks good for conducting the test right on schedule," said **Bruce Buckingham**, spokesman for Kennedy Space Center. Today workers will continue to install special sensors and plastic bags around the area believed to be leaking. Yesterday, workers over-tightened 48 bolts holding the suspect joint together, but officials are not optimistic that the tightening will stop the leak.

Workers also finished inspecting welds and piping in the area suspected of leaking and found no anomalies. The launch pad was also closed for hazardous operations as workers made final connections for installing a new auxiliary power unit aboard Atlantis. [Banke, **FLORIDA TODAY**, p. 5A, July 22, 1990.]

□ PADS 36A & B SPRUCED UP

The emergence of the U. S. commercial launch industry has brought new life to the rusting steel structures at Launch Complexes 36A and 36B. "The pads are real old," said **Ralph Howlington**, General Dynamics Corp.'s Pad 36B Site Manager. "They were built in the early 1960s and have been sitting for years in the open salt air. We had to go in and do a complete sandblast and paint job, repairing the parts that were too deteriorated." The launch towers have been repainted with an anti-corrosion paint and now appear dull gray. General Dynamics will launch its new Atlas rockets from pad 36B. Pad 36A will be used to launch military satellites beginning next year. [Banke, **FLORIDA TODAY**, p. 5A, July 22, 1990.]

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PRECISION MECHANICAL INC. CONTRACT

Precision Mechanical Inc. (Cocoa, FL) has been awarded a \$529,000 contract by Kennedy Space Center to remove and replace a rocket fuel collection tank and piping system. The company will install a 10,000-gallon stainless steel tank and piping system in the Orbiter Processing Facility. It will replace a concrete system now in use at the Shuttle hangar. The new system will funnel hazardous rocket propellants into the processing area. [NASA NEWS RELEASE NO. 115-90, July 2, 1990, "Cocoa Company Wins Contract," FLORIDA TODAY, p. 10E, July 22, 1990.]

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GENERAL DYNAMICS LAUNCH PLANS

General Dynamics intends to become the commercial space business with the biggest Brevard County launch plans; the company has 23 firm commitments for launches, options on 8 more and another possible 10 launches. Another of the big commercial space businesses, McDonnell Douglas, plans eight more launches and Martin Marietta has plans for one. Spaceport Florida Authority Director Ed O'Connor said the Cape Canaveral area is already reaping the benefit of the new industry. As frequency increases, there will be more jobs to run the launches, more construction and more need for offices. The impact from hiring more commercial space workers is expected to be felt throughout the Brevard County economy. [Oates, THE ORLANDO SENTINEL, pp. E-1 & E-3, July 22, 1990.]

July 22:

THIRD SHUTTLE LEAK CHECK

Technicians at Kennedy Space Center are preparing for another fuel leak check on Atlantis this week. KSC spokeswoman Lisa Malone said today that bolts connecting the external tank to its umbilical have been tightened beyond specifications in an attempt to clamp off a small hydrogen leak. NASA usually doesn't have sensors in the suspect area, so managers are unsure whether the leak is within safety margins. "We're getting a lot of data we've never collected before," Malone said.

If a leak is detected during the test, managers will have to determine whether it is within tolerable limits or whether Atlantis must be rolled back to the Vehicle Assembly Building for further repairs. Managers are awaiting the test results on Atlantis before deciding when Columbia will be restacked and rolled out to the launch pad. [Brown, FLORIDA TODAY, p. 4A, July 23, 1990.]

ATLAS LAUNCH: THIRD TRY

If the predicted stormy weather holds off tomorrow, NASA will try for a third time to launch a new commercial Atlas rocket and its \$189 million satellite. Atlas' satellite is designed to help scientists study the Earth's ionosphere and magnetosphere. Liftoff is set for 3:26 p.m., but NASA spokesman **Bruce Buckingham** said today that weather prospects are growing "worse and worse." Lightning is expected to be in the area by the scheduled liftoff time and high winds are predicted.

The forecast looks better for July 24 when launch chances are rated at 80 percent, according to NASA spokesman **George Diller**. Manufacturer General Dynamics hopes its commercial Atlas will compete with Europe's Ariane. NASA Shuttle Chief **Keith Hudkins** said, "We'll all be real happy to get the next successful launch behind us." ["Atlas Launch Set Today," *USA TODAY*, p. 1A, July 23, 1990, Brown, *FLORIDA TODAY*, p. 1A, July 23, 1990, Oates, *THE ORLANDO SENTINEL*, p. A-8, July 22, 1990.]

July 23:

SCRUB #3 FOR ATLAS

A problem with its electronics today forced General Dynamics to scrub the launch of its Atlas 1 commercial launch vehicle for the third time. Late today the company decided to call off an attempt for July 24 so the vehicle's faulty part can be tested. The attempt to launch came within four minutes of the scheduled 3:26 launch target; engineers tried to switch the source of the rocket's electrical power from the launch pad to batteries aboard the Atlas. Engineers could not ascertain whether the switch had actually occurred. **Jack Isabel**, General Dynamics spokesman, said, "It's disappointing when you can't launch, but one of these days everything will go right and we'll have a success." A liquid helium leak prevented the first attempt on July 20 and stormy weather at Cape Canaveral stopped the second attempt on July 22. [Banke, *FLORIDA TODAY*, p. 1A, July 24, 1990.]

July 24:

LEAK TEST PREPARATIONS

Final preparations are underway today for tomorrow's special test in which Atlantis' external tank will be filled partially with liquid hydrogen to look for leaks. Launch-team members hope to pull back the service structure from the Orbiter by 10 p.m., said **Bruce Buckingham**, NASA spokesman. Bolts have been tightened since the last test so officials will be looking to see what impact the tightening had on preventing a further leak in the joint between the tank's main 17-inch-wide fuel line and the fuel line that connects the tank to the Orbiter. Information from

tomorrow's test will help determine which Orbiter - Atlantis or Columbia - will lift off prior to the scheduled October 5 launch of Discovery and its Ulysses solar probe.

Yesterday, technicians loaded fresh liquid argon into containers on the Broad Band X-Ray Telescope, one of four observatories that make up the ASTRO-1 mission to be flown aboard Columbia. Argon must be replenished every ten days while Columbia remains on the ground. Workers also continued installing thruster assemblies aboard Discovery that help the Orbiter maneuver in space. One of the Shuttle's 44 thrusters was damaged in an accident last week. [Banke, **FLORIDA TODAY**, p. 7A, July 24, 1990.]

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40TH BUMPER ANNIVERSARY

Forty years ago today, the Bumper 8 double-stage rocket was launched from Cape Canaveral, FL. That was the first of 2,400 in the past four decades. It led to the establishment of the Joint Long Range Proving Grounds (now the Eastern Space and Missile Center) and transformed Brevard County into the Space Coast. The Bumper 8 was a hybrid, consisting of a German A-4 guided missile (also known as a V-2) and a WAC Corporal rocket. It was launched at 9:29 a.m. near what is now Complex 3 and flew 189 miles down range. [Minor, **THE ORLANDO SENTINEL**, July 24, 1990.]

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THRUSTER DAMAGE INVESTIGATION BOARD

Center Director **Forrest S. McCartney** has appointed an investigation board to examine the circumstances surrounding damage to an orbital maneuvering system (OMS) pod thruster at the Hypergolic Maintenance Facility (HMF) east test cell located in KSC's Industrial Area. [See stories dated July 18 and July 21.]

Chairing the Investigation Board is **Thomas Cain, III**, Chief, Operations Support Branch, Center Support Operations. The two other board members are: **Craig Baker**, Mechanical and Fluids System Engineer, Mechanical and Structures Section, STS Payload Operations Directorate and **Mickey Riddle**, NASA Site Manager at Launch Pad 39B. Ex-Officio board members are: **Patricia Lynn**, Safety Advisor; **Douglas Hendriksen**, Legal Advisor, and **Lisa Malone**, Public Affairs Advisor. [Malone, **NASA NEWS RELEASE NO. 135-90**, July 24, 1990.]

July 25:

CRUCIAL TEST FOR ATLANTIS

Atlantis will be the second Space Shuttle in two months to roll back from the pad to the Vehicle Assembly Building, officials said here today. The Orbiter failed its third leak test despite efforts to fix the problem on the pad. Liquid hydrogen began slowly flowing through the Orbiter's plumbing at 7:51 a.m. About 20 sensors specially installed for the test did not immediately detect a leak. At 8:14 a.m. the launch team switched to a faster pumping cycle. Less than four minutes later sensors picked up the first indications of a leak. Engineers immediately stopped filling the tank.

Minutes later, television cameras monitoring Atlantis' hardware showed a crack in the insulating foam surrounding the joint. NASA later determined that the crack was caused by a broken plastic bag - not the hydrogen leak. During the next hour, engineers started moving liquid hydrogen through Atlantis' plumbing three more times. A leak was detected almost immediately each time, halting the flow. The test ended at 9:40 a.m. and the tank was drained. NASA's chance to get two Shuttle missions launched before Discovery's Ulysses Probe Mission Oct. 5 depended on the outcome of today's test.

Concerning Atlantis' fuel leak, **William Lenoir**, Associate Administrator for Space Flight, said that today's test showed that hydrogen could still escape from a flange connecting fueling pipes to the external tank, which holds the supercold hydrogen and oxygen. Although bolts around the flange were tightened, hydrogen leaked at the same rate as in previous tests, he said. "We did not fix it, which did not surprise us," he told a news conference after the test. Last week he described the bolt tightening effort as a long-shot fix.

If had been no leak, NASA would have cleared Atlantis and its DOD cargo for launch, probably in mid-August; Columbia would have followed in mid-September. Managers then will have to decide how to shuffle three Orbiters among the VAB's two usable hangars. The fleet will be grounded until at least September when NASA will make a second attempt to launch Columbia. Shuttle Program Director **Robert Crippen** said today, "I feel very confident that Columbia is ready to go." But he said NASA might do a special fueling test before the flight to assure itself that the Shuttle had no leak. [Banke, **FLORIDA TODAY**, p. 1A, July 25, 1990, "NASA Seeks Source of Shuttle Fuel Leak," **USA TODAY**, p. 3A, July 25, 1990, Banke & Brown, **FLORIDA TODAY**, p. 1A-2A, July 26, 1990, Leary, **THE NEW YORK TIMES**, p. C18, July 26, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-11, July 26, 1990.]

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FOURTH TRY FOR ATLAS

"We have liftoff of Atlas Centaur AC-69 with the Combined Release and Radiation Effects Satellite," said **George Diller**, NASA's launch commentator, as the General Dynamics launch vehicle left the pad right on time at 3:21 p.m. today. About 23 minutes later, tracking aircraft flying near Angola listened for the payload's radio signals and confirmed that the CRRES had separated from its booster. Later Diller said, "We have about the best flight we could possibly hope for."

"So far, the spacecraft is performing flawlessly. We're glad to be in orbit," said Satellite Mission Director **Sid Saucier**. Speaking on behalf of his company, **Jack Isabel** said, "All of us at General Dynamics certainly are very proud of the performance today of our rocket as it made its commercial debut. I think really this is a springboard for many more Atlas launches from the Cape. It couldn't have been better."

The faulty electrical switch which had grounded General Dynamics' Atlas 1 rocket on its third launch attempt has been replaced; the liftoff was rescheduled for 3:21 p.m. today. Launch managers predicted there would be an 80 percent chance that the weather would be clear enough for launch. Flight managers met late yesterday and announced that the 13-story launch vehicle was ready to fly, said company spokesman Isabel.

Today's launching was the first of a commercial Atlas and the eighth commercial rocket launching by an American company. General Dynamics Space Systems Division (San Diego, CA) provided the \$65 million rocket and launching services in exchange for Atlas spare parts and tools from NASA. [Banke, **FLORIDA TODAY**, p. 7A, July 25, 1990, "NASA Seeks Source of Shuttle Fuel Leak," **USA TODAY**, p. 3A, July 25, 1990, Banke, **FLORIDA TODAY**, p. 1A, July 26, 1990, "Commercial Rocket Launched on Fourth Try," **THE NEW YORK TIMES**, p. C18, July 26, 1990, Oates, **THE ORLANDO SENTINEL**, July 25, 1990, Oates, **THE ORLANDO SENTINEL**, p. A-10, July 26, 1990.]

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APOLLO-SOYUZ ANNIVERSARY

Cosmonauts **Alexsey Leonov** and **Valeriy Kubasov** came to Brevard County tonight aboard a NASA aircraft with Apollo-Soyuz astronaut **Tom Stafford** to celebrate the 15th anniversary of the joint U. S. - U. S. S. R space mission known as the Apollo Soyuz Test Project. ASTP astronaut **Vance Brand** is in training for an upcoming Shuttle flight and was unable to come as was former astronaut **Donald "Deke" Slayton** who participated in ASTP commemorations elsewhere during the week.

The cosmonauts will tour Kennedy Space Center tomorrow, participate in a news conference and meet the launch team that helped launch the American portion of the Project. The Soviet crew will also narrate a mission film of their flight for the public at the Spaceport USA Galaxy Center at 5 p.m. [White, **FLORIDA TODAY**, p. 4A, July 26, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-10, July 26, 1990.]

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US & USSR: OZONE AGREEMENT

An agreement was signed in Moscow today to fly NASA's Total Ozone Mapping Spectrometer (TOMS) on a Soviet Meteor-3 spacecraft in 1991. The flight of the TOMS instrument on the Meteor-3 will provide critical environmental data on the yearly variability of the ozone hole over Antarctica. The agreement was signed by **George P. Esenwein**, Flight Programs Branch, Earth Science and Applications Division, Office of Space Science and Applications, NASA Headquarters and **Dr. N. N. Petrov**, Deputy Chief of Main Department, Soviet State Committee for Hydrometeorology, Moscow, following the U. S./U.S.S.R. Earth Sciences Joint Working Group (JWG) Meeting.

The Earth Sciences JWG was established under the U.S./U.S.S.R. Space Science Agreement signed in April 1987. The agreement was expanded to allow the exchange of flight opportunities for scientific instruments on each other's spacecraft during the May-June 1988 Reagan/Gorbachev Moscow Summit. TOMS will be the first U.S. instrument to fly on a Soviet spacecraft under this agreement. ["U. S. and U.S.S.R. Agree on Ozone Monitoring From Space," Rahn, **NASA NEWS RELEASE NO. 90-105**, July 27, 1990.]

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INDEPENDENT ADVISORY COMMITTEE NAMED

Vice President **Dan Quayle**, Chairman of the National Space Council, announced today that **Norman R. Augustine**, Chairman and Chief Executive Officer of the Martin Marietta Corporation, has been selected to head an independent advisory committee that is to study the future of the space program and how to manage it. No other members were announced for the twelve-member panel which is to be appointed by NASA Administrator **Richard H. Truly**.

The committee was created to review the future of the civil space program, looking at the appropriateness of projects already planned, organizational balance and structure, adequacy of skills, the balance between government and private sector roles, and what assurances there are that missions can

be successful. Augustine is considered in the aerospace industry to be an expert on management.

Augustine is the author of a book called Augustine's Laws in which he posits four principles of management that he might well advise NASA to use: plan carefully; emphasize quality; keep it simple and control costs. [Leary, **THE NEW YORK TIMES**, p. C18, July 26, 1990, Lunner, **FLORIDA TODAY**, p. 4A, July 27, 1990, Holton, **THE ORLANDO SENTINEL**, pp. A-1 & A-9, July 26, 1990.]

July 26:

APOLLO-SOYUZ REUNION

Astronaut **Thomas Stafford**, one of the three Americans involved in the Apollo Soyuz flight said today, "It was an example to the people of each country and to the rest of the world that if you put aside differences and work together toward a common goal, a lot can certainly be accomplished." Stafford and Soviet cosmonauts **Aleksey Leonov** and **Valeriy Kubasov** were in Brevard County to commemorate their historic mission which occurred 15 years ago this month. [See "Apollo Soyuz Anniversary" above.] Speaking, at a Kennedy Space Center press conference, of the lack of succeeding joint space ventures, Leonov said, "We talked about our cooperation, between American and Soviet, and are most ready to continue our very good tradition of Soyuz Apollo. In order to work together we need a mutual system - the same system, same documentation procedures, like we did when we constructed the docking system for Soyuz Apollo.

"If something happens up there - an accident in space," Leonov continued, "people will say we are not very smart. It's not technically complicated. It's only agreement among us, nothing else. Planes save each other, ships save each other, but spaceships don't." Stafford commented on the proposal to have a Soviet cosmonaut fly on an American Shuttle. "The idea of having a Soviet cosmonaut fly on the Space Shuttle, launched out of KSC would be tremendous," Stafford said. "I think it will happen in this decade." [Banke, **FLORIDA TODAY**, pp. 1A-2A, July 27, 1990.]

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COLUMBIA TESTED; ATLANTIS PREPPED

Technicians cleaned Launch Pad 39A today where Atlantis underwent hydrogen leak testing yesterday. Atlantis' external tank was drained and all traces of the volatile gas were purged from the tank, according to **Bruce Buckingham**, Kennedy Space Center spokesman. Following the cleanup and purging, the rotating service structure was returned to its usual position at the pad. Atlantis is now scheduled for rollback to the Vehicle Assembly Building.

Meanwhile, final testing of Columbia's new fuel line - taken from Endeavour - is underway. Technicians also installed part of the maneuvering system Discovery uses to steer in space. A collection of thrusters was placed in the Shuttle's nose. The Orbiter is scheduled to launch October 5. [Banke, **FLORIDA TODAY**, p. 4A, July 27, 1990.]

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MCDONNELL'S NEW CONTRACT

A \$5 million, one-year contract for payload processing was awarded to McDonnell Douglas Space Systems Co. at Cape Canaveral Air Force Station, officials said today. The contract, which begins in September, has four one-year options. The work will be performed for the U. S. Air Force's 6555th Test Group. McDonnell Douglas already prepares Department of Defense payloads for launch on the Shuttle. ["McDonnell Douglas Wins \$5 Million Contract at Cape Canaveral," **FLORIDA TODAY**, p. 4A, July 27, 1990.]

July 27:

SHUTTLING SHUTTLES AT KSC

Managers at Kennedy Space Center have a four-step plan for swapping Atlantis - now on Pad 39A - for Columbia - now in the Orbiter Processing Facility. In Step One, Columbia will be moved from the OPF to the Vehicle Assembly Building for mating with its boosters and external tank. Step Two calls for rolling Atlantis back from its perch on Pad 39A to a position just outside the VAB where it will remain for 24 hours due to lack of space in one of the world's largest buildings. Step Three calls for the mated Columbia to be rolled out to Pad 39A and Step Four moves Atlantis into the VAB. These maneuvers will produce two firsts in the Shuttle Era, i.e., the first time two consecutive Shuttles have been rolled back to the VAB and the first time that two fully assembled Shuttles will be seen outside, next to each other. "It's unfortunate that they are heading in opposite directions," said KSC spokesman **Bruce Buckingham**. [Banke, **FLORIDA TODAY**, pp. 1A-2A, July 28, 1990.]

July 28:

OFFICE SITE: HISTORIC KSC LOCALE

Part of a building where Apollo astronauts simulated lunar landings will be converted into office space under a contract recently awarded to Costello & Sons Corp. (Merritt Island, FL). The small contractor will have 90 days to complete the \$156,000 project in the Engineering Development Laboratory at Kennedy Space Center. During the Apollo Program, the lab served as the Flight Crew Training Building where astronauts used simulators to practice for the first manned moon landing and other Apollo missions. Costello & Sons will install a second-story platform in the

building's high bay which will serve as flooring for a 2,700-square-foot office. ["KSC Lunar Test Site to House Offices," **FLORIDA TODAY**, p. 10E, July 28, 1990.]

July 29:

MAGELLAN ON COURSE FOR VENUS

Steve Saunders, Chief Magellan Scientist at the Jet Propulsion Laboratory, is anxiously awaiting the arrival of Magellan at Venus on August 10. "We've tested it every which way but Sunday to check for failures that might not make it work," he said. "This thing must succeed because of the Hubble Space Telescope effect and the generally bad impression we've all been getting of how NASA has been conducting its affairs lately." **John Logsdon**, Space Policy Analyst at Georgetown University, said, "Magellan is one of the post-Challenger missions that is going to provide a real scientific payoff. If something would go wrong - God forbid - it would be another nail in the coffin in the agency to carry out its mission." [Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-4, July 30, 1990, "Magellan Will Enter Venus' Orbit Aug. 10," **FLORIDA TODAY**, pp. 10E & 9E, July 29, 1990.]

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SHUTTLE ENGINES COUNTED

If asked, would you be able to say how many rocket engines are aboard the Space Shuttle configuration? According to **FLORIDA TODAY** space writer **Jim Banke**, in his "Space for Kids" column, there are 67 rocket engines. He breaks them down as follows: the boosters employ 2 main rockets each and 16 small separation rockets; the Orbiter itself houses 3 main rockets, 2 Orbiter Maneuvering Systems (Engines) and 44 steering thrusters. [Banke, **FLORIDA TODAY**, p. 10E, July 29, 1990.]

July 30:

TEST DELAYS COLUMBIA ROLLOUT

"It's probably going to be late Wednesday [August 1] at the earliest, and quite possibly early Thursday [August 2], before we move Columbia [to the VAB]," said Kennedy Space Center spokesman **Bruce Buckingham**. The additional time will allow workers to recheck a seal on the external tank's main 17-inch wide fuel line. A tool used to measure a seal's flatness was late in arriving at KSC over the weekend, but was expected to arrive today.

Until the seal inspection is complete and officials clear the tank for flight, Columbia must remain in its hangar at the Orbiter Processing Facility. Six days after Columbia is moved to the Vehicle Assembly Building, technicians will rollback Atlantis from the pad. Then Columbia will head to the pad and Atlantis will move back into the VAB. KSC workers have

until August 13 to swap the Orbiters at the pad and open Columbia's cargo bay doors. If rollout is delayed, Columbia faces an additional month on the ground to recondition one of the four telescopes in its ASTRO-1 payload. Buckingham said, "We've already eaten into the contingency time by two days by shifting our roll to the VAB by two days. That only leaves us two or three days contingency time before it needs to be serviced again." [Banke, **FLORIDA TODAY**, p. 4A, July 31, 1990.]

July 31:

DISCOVERY MISHAP BOARD REPORT

Movement of an overhead access bridge while connected to a payload bay door was the primary cause cited by an investigation board for the improper raising of a payload bay door on the Discovery on June 4, 1990. Contributing causes to the improper raising included failure to follow the approved procedure, deficient work control systems to preclude bridge movement while connected to a payload bay door, and deficient work scheduling.

The board, which was chaired by **Paul Myers**, technical assistant to KSC's Director of Engineering Development, was not charged with determining any damage to flight hardware. However, thorough inspections have been performed and it has been determined that there was no damage to Discovery's payload bay door from this mishap. [Malone, **KSC NEWS RELEASE NO. 133-90**, July 31, 1990, "Report Faults Communication," **FLORIDA TODAY**, p. 6A, Aug. 1, 1990.]

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NO TO TANK TEST

After analyzing engineering data this past weekend, managers decided a planned test of Columbia's external tank was not necessary, according to **Warren Wiley**, Deputy Director of Shuttle Engineering at Kennedy Space Center. "When the tests were ordered we were looking at everything we could possibly measure. This was one thing that was thrown out," he said. Wiley said it is inappropriate to compare NASA's decision to skip the flatness test with problems on the Hubble Space Telescope. A flawed mirror on the telescope likely would have been detected with additional tests. Wiley said that even if the external tank seal's flatness affected its performance, the measuring tool which was to have been used probably would not have been exact enough to show it. Foregoing the test will enable the Orbiter to move a step closer to Launch Pad 39A; rollout is scheduled for August 9. [Banke, **FLORIDA TODAY**, p. 1A, August 1, 1990.]

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SHUTTLE RESCUE TEAMS DRILL

Approximately 300 people participated in an annual mock Shuttle rescue today. The scenario: Engine problems just after launch lead the seven-member crew to bail out into the Atlantic Ocean when a Return to Launch Site at Kennedy Space Center becomes impossible. Seven volunteers from Patrick Air Force Base played the astronauts, while astronaut Kevin Chilton observed from a Coast Guard cutter. The astronauts were transported by boat to a site near Savannah, GA, where they were released in the water with a locator beacon similar to the survival radios astronauts would use in an actual emergency. Helicopters were dispatched to pick up the "survivors." The whole exercise will be evaluated August 1. [Higginbotham, FLORIDA TODAY, p. 5A, Aug. 2, 1990.]

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LAUNCHING SOVIET PAYLOADS

Soviet space officials have asked Florida's permission to launch Proton rockets from Cape Canaveral Air Force Station, according to Ed O'Connor, Executive Director of the Spaceport Florida Authority, a Florida agency in charge of private commercial space development. O'Connor recently mentioned the possibility of launching Soviet rockets to a meeting in Miami.

The request was made for the Soviets in a letter by its U. S. agent, Space Commerce Corp. (Houston, TX). Along with the letter was an English language version of the operating manual for the Soviet Proton rocket. Since the request involves the use of Air Force facilities, it was forwarded to the U. S. Department of Commerce. A spokesman for the department said, "The Soviets have been trying to sell the Protons for a long, long time, but we have similar concerns about technology transfer with them as we do with the Chinese. We are concerned about this kind of competition from a non-market economy. A state-owned entity can easily engage in predatory pricing and cause a severe disruption in the market."

Tom Williams, a spokesman for McDonnell Douglas Space Systems Inc., said "I would be very surprised if our Department of Defense would even allow it. Besides that, I can't see what advantage it would be to the Russians to launch at Cape Canaveral. I find it hard to believe that they really want to." The major advantage is Cape Canaveral's nearness to the equator. The closer a launch pad is to the equator, the less fuel it takes to get a satellite payload into proper orbit, and the cost decreases, according to Peter Bishop, a University of Houston professor and director of the university's Space Business Research Center. [Oates and Burnett, THE ORLANDO SENTINEL, pp. A-1 & A-4, Aug. 1, 1990]

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SPACEPORT USA ATTENDANCE

The month ending today was the busiest in the history of Spaceport USA; 374,139 persons visited the Kennedy Space Center tourist center. As of yesterday, more than 2 million people had visited KSC, an increase of 6.1 percent over 1989. According to TW Recreational Services, which operates the center for NASA, many of the July visitors came from outside the United States. ["Spaceport Attendance Soars," **FLORIDA TODAY**, p. 10E, Aug. 12, 1990.]

AUGUST

August 1: ATLANTIS PART GOES TO DISCOVERY

A critical component now in Atlantis will be removed today by Kennedy Space Center workers and installed on Discovery because there are not enough of the parts available for the three-Shuttle fleet. **Henry Heimmer**, Chief of KSC's Orbiter Logistics Engineering Division, says the transfer of an auxiliary power unit does not mean that it is part of a trend of increasing cannibalization.

Heimmer said the current problem is a unique situation caused by a recent Johnson Space Center determination that tests have shown that APU's are cracking or chipping from prolonged exposure to their toxic hydrazine fuel, according to **Hal Taylor**, Manager of Orbiter Projects Engineering at JSC. Heimmer said that the transfer is necessary because only eight of the 14 available APU's are currently acceptable for flight. Nine approved units - or three for each Orbiter - are necessary to avoid cannibalizing.

Heimmer said that NASA plans to spend about \$100,000 to fix each unit and expects to have enough spares by November. The parts will have to be juggled until then. Workers are scheduled to move Columbia from the Orbiter Processing Facility into the Vehicle Assembly Building at 10:00 a.m. August 2 and roll the Orbiter out to Launch Pad 39A one week later. [Banke, FLORIDA TODAY, p. 5A, Aug. 2, 1990.]

August 2: QUAYLE NAMES ADVISORY BOARD MEMBERS

Vice President **Dan Quayle** today announced the names of eleven persons chosen to serve on the Advisory Committee on the Future of the U. S. Space Program, chaired by **Norman R. Augustine**. The members Quayle chose are: **Laurel Wilkening**, Provost at the University of Washington, will serve as Vice-Chairman; **Edward C. "Pete" Aldridge**, former Secretary of the Air Force, **Joseph P. Allen**, former astronaut, **D. James Baker**, President of Joint Oceanographic Institutions, former Rep. **Edward Boland** (D-Mass.), former Rep. **Don Fuqua** (D-FL), **Daniel J. Fink**, former Chairman of the NASA Advisory Committee, **Robert Herres**, retired Air Force General and former Commander in Chief, U. S. Space Command, **David T. Kerns**, member of the President's Education Policy Advisory Committee, **Louis J. Lanzerotti**, Chairman of the National Research Council Space Studies Board and former NASA Administrator **Thomas O. Paine**. The panel members were selected on the joint recommendation of NASA Administrator **Richard H. Truly** and Mr. Augustine in consultation with the Vice President.

The Advisory Committee will advise the NASA Administrator on overall approaches NASA management can use to implement the U. S. Space Program for the coming decades. The committee will have a broad charter and will report its findings within approximately four months. The Committee will operate as an independent entity, and will submit its findings to the Administrator of NASA and, with the Administrator, to the Vice President in his capacity as Chairman of the National Space Council. ["Advisory Committee Members Appointed," **THE VICE PRESIDENT'S OFFICE, Office of the Press Secretary**, Aug. 2, 1990, Halvorson, **FLORIDA TODAY**, p. 6A, Aug. 3, 1990, Holton, **THE ORLANDO SENTINEL**, Aug. 3, 1990.]

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COLUMBIA ROLLS TO VAB

Columbia rolled over from the Orbiter Processing Facility to the Vehicle Assembly Building after a 48-day fuel-line repair. Columbia, with its ASTRO-1 cargo aboard, will be outfitted with its external tank and solid rocket boosters in the VAB, then rolled out to Launch Pad 39A for its Sept. 5 launch. To make room for Columbia at the pad, Atlantis will be rolled back to the VAB at 12:01 a.m. August 8. Atlantis will remain outside the VAB till Columbia has completed its rollout to the launch pad August 9. At the pad, Columbia's cargo must be re-serviced with liquid argon, which cools the X-Ray telescope and allows it to work properly. If the re-servicing is not done by August 13, NASA officials said it will take an additional 16 days to recondition it. [Halvorson, **FLORIDA TODAY**, p. 6A, Aug. 3, 1990.]

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MINOR DELAY FOR DISCOVERY

An accident may have delayed Discovery's preparations for its Oct. 5 mission. Officials must decide August 3 whether they will have to replace part of a three-quarter-inch stainless steel line that carries freon to cool the Orbiter and astronauts in space; a small dent was discovered in the line today. **Bruce Buckingham**, Kennedy Space Center spokesman, said that repairing the dent, caused by a ladder resting against the line, could delay Discovery's scheduled August 18 move to the Vehicle Assembly Building by two to three days. The work schedule has room for such contingencies as repairs to the line, but there would be a 13-month delay if Discovery does not lift off by October 23 because the planets will no longer be aligned for Discovery's Ulysses probe to make its trip to the sun. [Glisch, **THE ORLANDO SENTINEL**, Aug. 3, 1990, Halvorson, **FLORIDA TODAY**, p. 6A, Aug. 3, 1990.]

August 3:

COLUMBIA MATED

Columbia was lifted onto its launch platform today and mated with its solid rocket boosters and external fuel tank in preparation for its rollout this week to Launch Pad 39A. Meanwhile, it was decided by Kennedy Space Center managers to remove and repair a dented cooling line from Discovery's payload bay. The line was damaged earlier in the week when a ladder leaning against it caused a quarter-inch deep dent. Initially, it was thought that replacement would cause a two to three-day delay in moving Discovery over to the Vehicle Assembly Building, but today KSC spokesman **Bruce Buckingham** said, "We are not giving up on getting over to the assembly building on August 18." Rollout for Discovery to Launch Pad 39B is set for August 25, with launch set for October 5. [Halvorson, **FLORIDA TODAY**, p. 4A, Aug. 4, 1990.]

August 4:

SPACE STATION FACILITY BIDDING

Kennedy Space Center is now accepting bids for construction of the new space station processing facility. The complex, which will be located in the KSC Industrial Area, will take three years to complete. KSC is requesting a total of \$88 million for the project. Prospective bidders will have until October 15 to respond and a contractor will be chosen by January 2, 1991. ["KSC Seeks Bids for Freedom Facility," **FLORIDA TODAY**, p. 10E, Aug. 5, 1990.]

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AMERTRON CONTRACT AWARDED

Kennedy Space Center has awarded Amertron Inc. (West Melbourne, FL) a \$609,484 contract to make nine batteries for use at the Shuttle launch pads. The 1,200-pound batteries will be grouped in three sets and installed into each of the space center's three Mobile Launcher Platforms. Orbiters receive electricity from ground lines through the platform. The new batteries will provide a backup power source lasting about 15 minutes in the event of a power failure at the pad. ["Amertron to Make Pad Batteries," **FLORIDA TODAY**, p. 10E, Aug. 5, 1990.]

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ROOF REPAIR CONTRACT AWARDED

A new contract for repairing the roof of the Kennedy Space Center headquarters building was awarded to CEI Florida Inc. (DeBary, FL). The \$191,097 contract is the second of three contracts to replace the building's entire roof which should be completely replaced by October 31. ["DeBary Company to Repair Roof," **FLORIDA TODAY**, p. 10E, Aug. 5, 1990, Kristofferson, **NASA NEWS RELEASE NO. 131-90**, July 25, 1990.]



SPACEPORT MOVIE WINS AWARD

Kennedy Space Center's Spaceport USA was awarded a first-place "Gold Camera Award" by the United States Festival Association for the film "The Boy from Mars," which is shown daily at the space center's visitors center. Spaceport USA has also recently been awarded a first-place award by the National Safety Council's Intercity Bus Division for having the lowest number of accidents per 100,000 vehicle miles. The Florida Motion Picture and Television Association presented a National Telly Award in the category of Best Special Program/Documentary for the informational videos running in the lobby of Spaceport USA. ["Boy from Mars' Wins Award," **FLORIDA TODAY**, p. **FLORIDA TODAY**, p. 10E, Aug. 5, 1990.]

August 5:

DISCOVERY READIED FOR OCTOBER

This weekend technicians at Kennedy Space Center are installing a new auxiliary power unit in Discovery to pressurize its hydraulic systems so they can assist in steering and operating the landing gear. The APU was borrowed from Atlantis and was tested late in the day. KSC spokesman **Karl Kristofferson** said, "They haven't been able to completely pressurize it with helium." He added that a faulty valve might have to be replaced.

Technicians also drained freon from Discovery's cooling system so repairs could be made on a dent in a three-quarter-inch diameter line. When the liquid is removed, workers will replace the section which was damaged last week when a ladder pressed against it. Meanwhile, electrical connection tests continued on Columbia, which is being prepared for a September 5 liftoff. Columbia will be mated with its solid rocket boosters and external tank on August 10. [Higginbotham, **FLORIDA TODAY**, p. 5A, Aug. 6, 1990.]



MANNING AT KSC WORKSHOP

Pat Manning, a professor of education at the University of Central Florida (Cocoa Campus) recently served as the National Science Teachers Association's regional coordinator for a workshop at Kennedy Space Center. For the third year in a row, NASA and the NSTA have co-sponsored the NASA Educational Workshop for Elementary School Teachers at KSC. Manning's job was to work with Kennedy Space Center officials in organizing and holding the event which provided 22 first-through sixth- grade teachers a behind-the-scenes look into space operations at the space center. It also allowed the teachers to review NASA information programs available to teachers. "These teachers saw everything from the launch pad to the Shuttle landing site. I was excited

to be able to be involved at this depth," she said. ["Teacher Helps With KSC Workshop," **FLORIDA TODAY**, p. 9E, Aug. 5, 1990.]

August 6:

SHUTTLE SWAP DELAYED

Problems encountered while Columbia was being mated with its solid rocket boosters and its external tank have delayed the planned Shuttle swap at Launch Pad 39A. Atlantis will remain in place until at least 12:01 a.m. August 9 and Columbia's rollout will not occur until early August 10.

Technicians in the Vehicle Assembly Building this weekend had difficulties as they tried to mate Columbia with its external tank. Two halves of a pipeline through which electrical wires are routed would not align properly at first, according to Kennedy Space Center spokeswoman **Pat Phillips**. She said that the difficulty was not a major problem but "it just cost us some time." Time is important for Columbia's move to the launch pad because technicians have a tight schedule for servicing the Orbiter's X-Ray Telescope payload. If the telescope is not serviced on time, it will take an additional 16 days to recondition the instrument. Columbia's launch is now scheduled for September 5. [Halvorson, **FLORIDA TODAY**, p. 5A, Aug. 7, 1990.]

August 7:

WRECK INJURES KSC EMPLOYEE

A Kennedy Space Center employee was treated and released from Wuesthoff Hospital (Rockledge, FL) after her car collided today with an EG&G Patrol Officer, KSC officials said. Patrol Officer **William Kirby Lanouv**, (Titusville, FL), was heading north on Courtenay Parkway to Spaceport USA on an emergency call about 4:30 p.m. when he tried to make a left turn onto NASA Causeway. His car collided with one driven by **Rosalyn J. Jones**, (Melbourne, FL) who was heading south, according to KSC spokesman **Dick Young**. The officer was not injured and no charges were filed, he said. The accident is being investigated. ["KSC Employee Injured in Wreck," **FLORIDA TODAY**, p. 1B, Aug. 8, 1990.]

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NO LEAK TEST FOR COLUMBIA

There will be no leak test on Columbia, NASA announced today. The test was called off in order to make the launch attempt before the beginning of a critical October launch window for Discovery and the Ulysses solar probe. "If we failed, if we did have a leak, we don't have enough time to do anything...and go fly before Ulysses," said **William Lenoir**, Associate Administrator for Space Flight. If Columbia has a leak, it would be

detected during the actual fueling six hours before its September launch and it would be postponed until after Discovery's October launch.

Columbia has been outfitted with a new pipeline from Endeavour and NASA believes that it will not leak during fueling, according to Lenoir. Columbia's leak test had been scheduled for no earlier than August 18. But if the Orbiter had failed the test, there would not have been sufficient time to effect repairs without interfering with Discovery's launch, Lenoir said. "Our conclusion is the test wouldn't help us," he said. [Halvorson, **FLORIDA TODAY**, p. 5A, Aug. 8, 1990.]

August 8: NEW RANGE CONTROL CENTER

The Air Force will spend about \$1.4 billion through 1996 to update its launch capabilities and part of that money has been expended at Cape Canaveral Air Force Station to construct a new range control center, according to Air Force Space Systems Division Commander Lt. General **Donald Cromer**. "Even in this period of declining defense budgets, the importance of space to our national security is well recognized," said Cromer at a dedication for the \$19.5 million Test Operation Control Center at CCAFS. "To be a 21st-century superpower, the United States needs the ability to help friends and quell enemies within hours. I think we're seeing that today over in Kuwait," Cromer said.

The center includes computers and advanced fiber optics technologies that will speed the processing of rockets, cutting the time needed between tests and launches from several days to as little as an hour. [Brown, **FLORIDA TODAY**, p. 1B, Aug. 9, 1990.]

□ ATLANTIS ROLLBACK; COLUMBIA TO ROLL OUT

The Space Shuttle Atlantis was rolled back to Kennedy Space Center's Vehicle Assembly Building tonight for fuel leak repairs. Meanwhile, Columbia was prepared for rollout to Launch Pad 39A today. Atlantis' rollback began at 10:14 p.m. and was scheduled to arrive at the VAB at approximately 4 a.m. August 9. A heavy afternoon thunderstorm delayed Atlantis' return to the VAB for about six hours. **Bruce Buckingham**, KSC spokesman, said, "The main concern was for the Shuttle's tiles." A Shuttle carries some 25,000 tiles at an installation cost of \$2,000 apiece. [Halvorson, **FLORIDA TODAY**, p. 1A, Aug. 9, 1990.]

August 9:

UPDATE: HUBBLE INVESTIGATION

Scientists today believe they know what caused the Hubble Space Telescope to be out of focus. NASA's Hubble Space Telescope Investigation Board said that the "reflective null corrector" may have been flawed. The corrector is an optical reference device which was used to measure very precisely the surface figure of the HST primary mirror during its manufacture. The device has been systematically checked over the last two weeks with the result that a clear discrepancy of approximately 1 millimeter between the design of the null corrector and the measuring device exists.

The investigation board will now concentrate its efforts in two areas: refining the measurement of the observed reflective null corrector spacing discrepancy and continuing to examine all aspects of the reflective null corrector and associated test apparatus as they were constructed and used in the fabrication of the primary mirror. A meeting of the Board to review test procedures and resulting data will convene at NASA Headquarters in Washington, D. C., on August 15 and 16. [Keegan, NASA NEWS RELEASE (no number), Aug. 9, 1990.]

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COLUMBIA ARRIVES AT PAD

Columbia, with its repaired fuel-line coupling and borrowed part from Endeavour, returned to Launch Pad 39A for liftoff around September 4 on an astronomy mission. Atlantis, plagued by an uncorrected fuel leak, was rolled back to the Vehicle Assembly Building for repairs. ["Tiny Error Caused Big Hubble Trouble," USA TODAY, p. 3A, Aug. 10, 1990.]

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ATLANTIS: POSSIBLE HAIL DAMAGE

NASA has another problem with Atlantis: possible hail damage during this afternoon's hail storm. "We won't know what the amount of damage is, if any, until Atlantis is in the Vehicle Assembly Building and platforms can be put in place to perform inspections," said **Bruce Buckingham**, NASA spokesman. A strong thunderstorm, accompanied by gusting winds, lightning and hail, hit the VAB area just as workers were to move Atlantis into the VAB for fuel-line repairs. Work rules prohibit workers from moving an Orbiter when lightning is within 20 miles of the launch pad, so Atlantis had to sit out the storm just 60 feet from the VAB. An hour after weather warnings were cancelled - at 5 p.m. - Atlantis was moved into the VAB. A preliminary inspection at 9 p.m. showed no storm damage. [Banke, FLORIDA TODAY, p. 6A, Aug. 10, 1990.]

August 10: MAGELLAN SPACECRAFT TO ORBIT VENUS

NASA's Magellan spacecraft fires its rocket today to enter the orbit of Venus on a mission to map the planet's surface. The spacecraft was launched 15 months ago and has travelled already some 947 million miles. The four-ton craft is ready to orbit Venus at 12:32 p.m. "I suspect I'm going to be very nervous" until Magellan is safely in orbit, said **Tony Spear**, Magellan's Project Manager. "It's like your life can go either one direction or another, so I don't plan after Friday right now."

Pictures are not expected as soon as those from Voyager's flyby of Neptune last year. "This is a big job. It's a very precise system," said **Steven Saunders**, Magellan Mission Scientist. "It's not the sort of thing that produces a lot of pictures right away." [Lunner, **FLORIDA TODAY**, pp. 1A-2A, Aug. 10, 1990, "Tiny Error Caused Big Hubble Trouble," **USA TODAY**, p. 3A, Aug. 10, 1990.]

□ ATLANTIS TILES REPARABLE

Most of the tile damage to Atlantis is on the left side of the Orbiter; in all some 90 to 100 of the delicate heat-resistant tiles were damaged by hail when Atlantis sat unprotected next to the Vehicle Assembly Building yesterday. "We're not scheduled to fly Atlantis until after Discovery with the Ulysses Solar Probe in October, so we do not expect [the tile repair] to be an impact on the schedule," said **Lisa Malone**, Kennedy Space Center spokeswoman. Atlantis had to be left outside because of a shortage of space which developed when Columbia was awaiting rollout to Launch Complex 39A. Tile work will begin when Atlantis is moved from the VAB to the Orbiter Processing Facility. [Banke, **FLORIDA TODAY**, p. 5A, Aug. 11, 1990.]

August 11: COLUMBIA'S CONNECTIONS TESTED

Technicians began a two-day electrical connections test on Columbia today; it is a test usually performed in the Vehicle Assembly Building. Spokeswoman **Lisa Malone** said, "Things are moving right along, and there are no problems to report." Following the test, workers will check parts of Columbia's propulsion systems for leaks. This test too is usually performed inside the VAB. The Shuttle's cargo, the Broad Band X-Ray Telescope was serviced today at the pad. Currently, Columbia is expected to launch September 1, but the official date will only be announced after August 21 when the Flight Readiness Review is completed. [Banke, **FLORIDA TODAY**, p. 7A, Aug. 12, 1990.]

August 12:

FUEL LINE CHECK FOR ATLANTIS

The Space Shuttle Atlantis is on the move; this time the Orbiter - now in a horizontal position - rolls to the Orbiter Processing Facility so technicians can take a closer look at the fuel line which has grounded the Shuttle. Technicians will also have to repair some 90 tiles which were damaged during a rainstorm. Meanwhile, Columbia completed a major two-day electrical and mechanical systems integration test at Launch Pad 39A. A Flight Readiness Review has been set for August 20 and a firm launch date will be announced following the review. [Brown, **FLORIDA TODAY**, p. 6A, Aug. 13, 1990.]

August 13:

VAB SPRINKLER SYSTEM PROBLEM

The Vehicle Assembly Building's sprinkler system failed today, allowing water to drip onto power transformers. NASA was forced to cut off power to the high bay where the Shuttle Atlantis is located. Kennedy Space Center spokeswoman **Lisa Malone** had no estimate of how much water leaked or how long the sprinkler system leaked. She did say that the amount of water was not "enormous." She added that neither Atlantis nor its external tank and solid rocket boosters were doused with water. Late today, two electrical panels which supply lighting to the high bay area underwent repairs. The system failure is under investigation. [Halvorson, **FLORIDA TODAY**, p. 5A, Aug. 14, 1990.]

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NEW COLUMBIA LEAK INSIGNIFICANT

A critical 24-hour leak test of Columbia's main propulsion system will be conducted August 16 on Launch Pad 39A. The test involves pumping gaseous helium through the Orbiter's main propulsion system, including the external tank and three main engines. A similar test over the weekend uncovered a small leak in the same part of the external tank which leaked on Atlantis, but Kennedy Space Center spokeswoman **Lisa Malone** said the leak was within allowable limits and would not prevent plans to launch in early September. [Halvorson, **FLORIDA TODAY**, p. 5A, Aug. 14, 1990.]

August 14:

ATLANTIS FUEL LINE REPAIRS

Atlantis was finally towed to the Orbiter Processing Facility tonight where it awaits the start of fuel line repairs tomorrow. Between 90 and 100 heat-resistant tiles, damaged last week when Atlantis was stuck outside the VAB in a thunderstorm, also will be repaired. [Halvorson, **FLORIDA TODAY**, p. 4A, Aug. 15, 1990, Halvorson, **FLORIDA TODAY**, p. 6A, Aug. 16, 1990.]

□ COLUMBIA COMPLETES ELECTRICAL CONNECTIONS TEST

Technicians at Launch Complex 39A completed a test of all electrical connections between Columbia and its boosters, external tank and launch platform. Kennedy Space Center spokeswoman **Lisa Malone** reported no problems in the test results. Columbia undergoes a 24-hour gaseous helium leak test on its main propulsion system. [Halvorson, **FLORIDA TODAY**, p. 4A, Aug. 15, 1990.]

August 16: COLUMBIA: READY TO FLY?

Top Kennedy Space Center officials gather next week for a Flight Readiness Review which will both determine Columbia's flight status and set a firm date for launch if the Orbiter is deemed ready to launch. "We'll be going over all areas that support launch and landing to determine readiness for the mission," said **Lisa Malone**, a KSC spokeswoman.

The results of today's 24-hour critical test of Columbia's main propulsion system will provide important information for the flight readiness review. The test begins at 8 a.m. and involves pumping gaseous helium through the system in attempts to uncover any possible leaks. [Halvorson, **FLORIDA TODAY**, p. 6A, Aug. 16, 1990.]

□ LAUNCH PREDICTION FOR COLUMBIA

"The Kennedy team is hoping to recommend September 1 as a launch date [for Columbia]," said **John Conway**, Director of KSC's Payload Management and Operations. Conway spoke at the conclusion of today's Launch Readiness Review. **Jay Honeycutt**, Director of Shuttle Management Operations at the space center said, "In the next few weeks, we expect to see the Shuttle Columbia launch and light up the East Coast." The decision to set a firm launch date will be taken following the two-day Flight Readiness Review meetings at Kennedy Space Center August 20 and 21. [Halvorson, **FLORIDA TODAY**, p. 4A, Aug. 17, 1990.]

□ ULYSSES READY; IS COLUMBIA?

John Conway, Director of Payload Management and Operations at Kennedy Space Center said of the Ulysses Planetary Probe today, "We're ready to go fly this thing." The only thing the probe is waiting for is its launch vehicle, the Shuttle Discovery. The Ulysses Spacecraft is scheduled to move to the launch pad from a satellite processing facility on August 28 followed by Discovery August 31. If Discovery's rollout must be delayed,

it will remain in the Vehicle Assembly Building until after Columbia's launch which is targeted unofficially for September 1.

Current planning calls for Discovery to be launched between October 5 and October 23 with four days of contingency time built into that period. Delays in moving Discovery to the launch pad would erode the contingency time. After October 23, NASA would have to wait 13 months until the planets are properly aligned again for the Ulysses to reach its destination for its study of the sun's magnetic field and the origin of solar winds. [Halvorson, "Ulysses Probe Ready to Fly - All It Needs Now Is A Lift," FLORIDA TODAY, p. 4A, Aug. 17, 1990.]

August 17: DELTA LAUNCH AWAITS WEATHER

There's a 50-50 chance that the weather will cooperate sufficiently for the McDonnell Douglas Space Systems Co. to launch a Delta 2 tonight, according to Air Force spokesman **Ken Warren**. The Delta's payload is a British Satellite Broadcasting Marcopolo 2 satellite slotted for geosynchronous orbit at 23,000 miles above Earth and near another Marcopolo satellite launched in 1989. The BSB's Director of Engineering and Operations, **Ellis Griffith**, said, "It's rather a surprise to come to Florida and find we have British weather." [Banke, FLORIDA TODAY, p. 4A, Aug. 17, 1990, Oates, THE ORLANDO SENTINEL, Aug. 17, 1990.]

□ FUNNEL CLOUDS AT KSC

Technicians at Kennedy Space Center evacuated Launch Pad 39A after meteorologists issued a tornado warning which lasted from 2:45 to 4:03 p.m. today. "Everybody on the base was instructed to take shelter," said KSC spokeswoman **Lisa Malone**. She added that no funnel ground touched down and there was no apparent damage. [Evans, FLORIDA TODAY, p. 1B, Aug. 18, 1990.]

□ DELTA 2 MARCOPOLO LAUNCH

"The vehicle is going right down the middle of the path, just the way we like to see it," Launch Commentator **Ray Adams** said of tonight's launch of a McDonnell Douglas Delta 2. The Delta launch came at 8:42 p.m. on a day which was filled with afternoon rain. The Delta carried a \$100 million British Satellite Broadcasting Marcopolo 2 spacecraft, identical to one launched a year ago.

Liftoff had been delayed temporarily by thunderstorms and by the temporary failure of the Air Force Range-Safety System which would have

destroyed the launch vehicle if it had veered off course. The Air Force fixed the problem and the launch proceeded smoothly. About 28 minutes after launch, McDonnell Douglas confirmed that the satellite had separated from its booster.

The Delta launch was the 198th since 1960 for McDonnell Douglas and its 20th consecutive successful liftoff. "This nighttime launch of the Delta 2 was just spectacular and we are pleased that Marcopolo 2 is off to a great start," said Hughes Aircraft Co. spokesman **Emery Wilson**. Hughes was the manufacturer of the Marcopolo and for this launch it had not only to build the satellite, but find insurance and procure the launch services; it marked the first time the company has had to accomplish all three tasks. [Banke, **FLORIDA TODAY**, p. 7A, Aug. 18, 1990.]

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COLUMBIA LEAK REPAIRED

Columbia's tiny main engine leak has been repaired on Launch Pad 39A; this cleared the way for a critical main propulsion system test which began late today and concludes tomorrow. Technicians removed and replaced seals in the engines to stop the leaks, according to Kennedy Space Center spokeswoman **Lisa Malone**. Meanwhile, nonessential launch pad personnel will leave the pad area tomorrow so hazardous propellants can be loaded aboard Columbia's on-board storage tanks for the Orbiter's auxiliary power units and the hydraulic power units on the twin solid rocket boosters. [Halvorson, **FLORIDA TODAY**, p. 7A, Aug. 18, 1990, Banke, **FLORIDA TODAY**, p. 9A, Aug. 19, 1990.]

August 20:

COLUMBIA LAUNCH: SEPTEMBER 1

Barring unforeseen difficulties with its fuel lines, Columbia is scheduled for launch between 1:17 and 2:21 a.m. September 1, NASA's managers decided today. The announcement followed a review of Columbia's flight preparations at Kennedy Space Center. The meeting, which was to have continued August 21, finished a day early. "Today we conducted a complete review of the STS-35 mission as well as the results of the liquid hydrogen leak investigation," said Associate Administrator for Space Flight **William Lenoir**.

"Based on this review," Lenoir added, "I believe STS-35 is ready to fly. Both the NASA and Contractor Teams deserve high praise for all their efforts. It is through their hard work that we are now in a position to launch Columbia." Still to come is tomorrow's Flight Readiness Test which is a 16-hour check of the main engine valves and the Orbiter's steering surfaces. [Brown, **FLORIDA TODAY**, p. 1A, Aug. 21, 1990, "Columbia

Launch Is Set for Sept. 1, 1:17 A. M.," **THE ORLANDO SENTINEL**, p. A-9, Aug. 21, 1990, "STS-35 Launch Advisory," Aug. 20, 1990, "Shuttle Cleared for Launch," **USA TODAY**, p. 3A, Aug. 21, 1990.]

August 22: **COUNTDOWN STARTS AUGUST 29**

The countdown for the launch of Columbia will begin at 1:00 a.m. August 29; launch is expected to come at 1:17 a.m. September 1. Work toward the launch is progressing smoothly, according to NASA. Workers are scheduled to pack two spacesuits into Columbia's middeck airlock today. There is no plan for a spacewalk, but the suits are carried in case of emergency. [Banke, **FLORIDA TODAY**, p. 6A, Aug. 22, 1990.]

□ **KSC AND RESERVE CALL-UP**

Kennedy Space Center is reviewing its civil service and NASA contractor workforce to identify reservists in key positions, according to spokesman **Karl Kristofferson**. "If someone gets called up, we're trying to find out who would back them up," Kristofferson said, adding that 2 percent of NASA's civil-service workforce at KSC is on active reserve. Figures for NASA contractors at KSC were not available, he said. [Mercedes, **FLORIDA TODAY**, p. 4A, Aug. 23, 1990.]

□ **LEAK TEST PROCEDURES EXAMINED**

NASA managers meet this week to determine whether they should change the way it treats hydrogen fuel leaks during countdowns. One suggestion which will be considered: change launch rules to make it easier to approve a launch despite a leak and installing fans at the launch pad to disperse unacceptable concentrations of hydrogen gas. The fans would blow a stream of gaseous nitrogen at the area where NASA discovered fuel line leaks earlier this summer and prompted NASA to rollback both Columbia and Atlantis for repairs.

According to the Associate Administrator for Space Flight William Lenoir, the number and location of leak-detecting sensors on the outside of the Orbiter are also up for discussion. "We do need to make sure we don't get ourselves in a situation that might camouflage a dangerous leak," Lenoir said. He said launch officials feel confident now that they understand the problems which grounded Atlantis and Columbia and they understand the solutions to the problems.

Lenoir said that glass beads found in hydrogen lines from Columbia contributed to its leak. About 100-200 tiny glass beads were found when

the seals were disassembled, along with some metal chips, he said. How the beads got in the lines is unknown. The only remaining problem with Columbia which is scheduled for a September 1 launch, is a faltering system which keeps the Orbiter's cargo bay cool. The rate at which freon coolant is flowing through the plumbing is lower than expected, but currently is within launch rules. [Banke, **FLORIDA TODAY**, p. 6A, Aug. 23, 1990.]

August 23: **DISCOVERY READY FOR MATING**

Discovery gets a ride aboard a 76-wheel transport vehicle this weekend for a quarter-mile ride from the Orbiter Processing Facility to the Vehicle Assembly Building. In the VAB, Discovery will be mated to its solid rocket boosters and its external tank. NASA officials expressed hope that Discovery could be rolled out prior to Columbia's September 1 launch. from Launch Complex 39A. **William Lenoir**, Associate Administrator for Space Flight, said, "We may be seeing two birds out on the launch pads before the end of the month." Discovery will roll out to Launch Complex 39B on August 31 if all goes as planned. If the rollout is delayed, Discovery will remain in the VAB until after Columbia's launch. Discovery will carry the Ulysses Planetary Probe into orbit after an October 5 liftoff. [Halvorson, **FLORIDA TODAY**, p. 10A, Aug. 24, 1990.]

August 25: **CIVIL SERVICES FACES FURLOUGHS**

A one-day furlough may await the 2,400 civil service workers at Kennedy Space Center if Congress fails to pass the 1991 budget by the start of the new fiscal year on October 1. "It's a situation we've faced before. This is a drill we've gone through numerous times when we have a case where the federal government doesn't have a budget passed and we have to operate under a continuing resolution," said KSC spokesman **Dick Young**. "We're talking about a potential furlough. We're talking about probably a day off for each person - just a one-time shot during the early part of October." NASA Administrator **Richard Truly** was expected to outline how space agency operations will be carried out in the event of a furlough. [Halvorson, **FLORIDA TODAY**, p. 11A, Aug. 26, 1990.]

□ **COUNTDOWN STARTS AUGUST 29**

Beginning at 1 a.m. August 29, the countdown will begin for the September 1 launch of Columbia. There may, however, be an interruption in the countdown to allow Discovery to be rolled out to Pad 39B. Columbia's STS-35 crew will arrive at KSC on August 29; the seven-member crew includes Commander **Vance Brand**, Pilot **Guy Gardner**,

Mission Specialists John "Mike" Lounge, Jeffrey Hoffman and Robert Parker, and Payload Specialists Ronald Parise and Samuel Durrance. At Kennedy Space Center, the crew will practice emergency landings in the Shuttle Training Aircraft at the Shuttle Landing Facility. They will also undergo briefings and final pre-flight medical examinations and space suit checks. [Halvorson, **FLORIDA TODAY**, p. 11A, Aug. 26, 1990.]

August 26: **DISCOVERY'S ROLLOVER SLOWED**

Workers in the Orbiter Processing Facility ran into trouble with the lock on Discovery's landing gear and that prevented the planned rollover from the OPF to the Vehicle Assembly Building at 8 p.m., according to Kennedy Space Center spokesman **Bruce Buckingham**. Work crews planned to try again August 27. NASA hopes to move Discovery out to Pad 39B August 31. NASA may postpone Columbia's launch until Discovery can be rolled out to the pad; there are only 18 days from October 5 to launch Discovery and its cargo - the Ulysses Solar Probe. Otherwise, NASA must wait a year for the planets to properly realign and putting Discovery on the pad before Columbia's launch will help ensure that Discovery will meet its launch schedule. Columbia's launch window September 1 is from 1:17 a.m. to 3:31 a.m. [Halvorson and Nagy, **FLORIDA TODAY**, p. 1A, Aug. 27, 1990, Banke, **FLORIDA TODAY**, p. 6A, Aug. 28, 1990.]

August 27: **ATLANTIS FUEL LEAK**

Space agency officials said today that a fuel leak in Atlantis' external tank was not exactly where they thought it was. They expect tests at Marshall Space Flight Center (Huntsville, AL) to determine the leak's location precisely within the fuel line. **Bob Schwinghamer**, a Manager at MSFC, said that the discovery in Atlantis' fuel line was not expected to affect the attempt to launch Columbia on September 1. [Banke, **FLORIDA TODAY**, p. 6A, Aug. 28, 1990.]

□ **BUDGET CRUNCH AFFECTS LAUNCH GUESTS**

Unless the United States Congress resolves its disagreements over the federal budget, the Space Shuttle Discovery may liftoff on October 5 without its usual complement of launch guests at Kennedy Space Center. **Eugene Marianetti**, Chief of Special Events for NASA, said that the agency will have to "put its hospitality on hold." If the budget impasse is not broken before September 30, NASA won't have enough time to arrange for Shuttle launch guests for the October launch of Discovery. The Office of Management and Budget recently directed federal agencies to draw plans to cut expenses drastically to avoid furloughs for most employees. NASA

announced today that it will furlough its 2,400 employees at KSC for one day during the first half of October if Congress should fail to pass a new budget by the beginning of the fiscal year, October 1. [Banke, **FLORIDA TODAY**, p. 6A, Aug. 28, 1990.]

August 28: **LEAKS LOOK SIMILAR SAYS NASA**

NASA's leak investigators now suspect that the leaks found on both Columbia and Atlantis trace to the 17-inch disconnect valve and not to a joint where the fuel line meets the external fuel tank. The experts believe that tiny glass beads found in Columbia's fuel lines damaged seals on the valve and they speculate that the same thing may have happened to Atlantis. Tests at Marshall Space Flight Center provided clues for the conclusion that Atlantis' disconnect valve was involved in the leak. [Glisch, **THE ORLANDO SENTINEL**, Aug. 29, 1990.]

August 29: **COLUMBIA'S COUNTDOWN**

The countdown, finally, for Columbia's STS-35 mission began this morning at 1 a.m. and will run until launch on September 1; the launch window is from 1:17 a.m. until 3:31 a.m. The space agency had considered delaying the launch until Sunday to allow time for Discovery to ride out to Launch Complex 39B. The schedule will stay on course because Discovery will not be ready for the rollout until the afternoon of September 1 at the earliest, according to Kennedy Space Center spokeswoman **Lisa Malone**. The STS-35 crew is expected to arrive at KSC at about 9:30 p.m. today. ["Columbia Countdown Goes Smoothly," **THE ORLANDO SENTINEL**, Aug. 30, 1990, Halvorson, **FLORIDA TODAY**, p. 1A, Aug. 29, 1990.]

□ **COLUMBIA CREW AT KSC**

Columbia's STS-35 crew arrived at Kennedy Space Center just after 11 p.m. tonight and will begin final preparations for their September 1 night launch. "We have a great ship out there and we have all the confidence in the world in that machine," said Columbia's Commander **Vance Brand**. On August 30 and 31, the crew will practice emergency Shuttle landings. [Halvorson, **FLORIDA TODAY**, p. 1A, Aug. 30, 1990.]

□ **MCCULLEY JOINS LOCKHEED**

Veteran Shuttle astronaut **Michael McCulley** will retire from both NASA and the Navy in October after Discovery's launch of Ulysses to take become Lockheed Space Operations Co.'s vice president and deputy director of the Kennedy Space Center launch site. "I am not changing

teams with this move, only my position on the team," said McCulley, who most recently piloted Atlantis on the Galileo mission in October 1989. **Donald Puddy**, Director of Flight Crew Operations at Johnson Space Center, said, "Mike has always been a top-notch performer in every way. Both as a pilot and as a technical expert, he has made significant contributions to the Shuttle Program and to my office." McCulley's current is the head of the Astronaut Support Team at Kennedy Space Center. His wife, the former **Jane Thygeson**, is a native of Melbourne, Florida. [Halvorson, **FLORIDA TODAY**, p. 12A, Aug. 30, 1990.]

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MIDDLE EAST AFFECTS RESCUE CREWS

Events in the Middle East have impacted the crews who provide rescue support for Shuttle launches. The primary teams have been deployed in the Middle East and backup crews have been readied. "There was already someone standing by ready to jump in line and perform the task for us," said Air Force Col. **Dave Phillips**, Director of the Department of Defense's Shuttle Support Office at Patrick Air Force Base. "We have a commitment from all of the commanders and the organizations concerned that they are ready to support this mission."

The Shuttle Support Office draws on National Guard, reserves and active duty personnel nationwide. "We have trained more people than we really need so that we always have a backup. We are able to mix and match and get the required number without continually overtaxing any one unit." Phillips added that medical personnel are the most scarce now, but even if the situation in the Middle East worsened, the DOD would still be able to attend to any injured astronauts. [Banke, **FLORIDA TODAY**, p. 12A, Aug. 30, 1990.]

August 30: PAYLOAD PROBLEMS POSTPONE STS-35

The STS-35 mission will be delayed until at least September 5 because of a problem with an electronics package inside Columbia's cargo bay. "I think there's a lot of confidence the launch will happen next week - at best the middle of the week if not Thursday, Friday or Saturday," said **Bruce Buckingham**, NASA spokesman at Kennedy Space Center. Astro-1's problem has been traced to an avionics box. The signal from one of the Astro-1 observatory's four telescopes was lost after Columbia's cargo bay doors were closed August 29. Workers will resolve the problem by entering the cargo bay; the lengthy process involves opening the cargo bay doors and draining the liquid hydrogen and liquid oxygen that power the Shuttle's electrical systems.

Sensors on the observatory's X-Ray telescope are not sending information to ground controllers. The sensors measure the temperature and pressure of two tanks of superchilled argon on the telescope. The argon keeps the telescope chilled so it can work properly in space. Without the information, ground controllers would not recognize any problems with the argon system just before liftoff and during ascent into orbit. [Banke, **FLORIDA TODAY**, p. 1A, Aug. 31, 1990, Broad, **THE NEW YORK TIMES**, p. A12, Aug. 31, 1990.]

August 31:

TELCO SYSTEMS CONTRACT

Telco Systems (Titusville, FL) has been awarded a \$271,417 contract to provide fiber-optic multiplexing systems for use in digital communications networks at Kennedy Space Center. Under the firm fixed price contract, the small business firm will design, assemble and test 11 multiplexers in 90 days for shipment to KSC. Lockheed Space Operations Co. will install the equipment in several Space Shuttle and payload processing facilities. These buildings are linked by fiber-optic cable, and the multiplexers will allow the simultaneous use of up to 672 channels through the cables. Eventually, all major KSC facilities will be connected through a fiber-optic cable network. [Kristofferson, **NASA/KSC NEWS RELEASE NO. 148-90**, August 31, 1990.]

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REPAIR DETERMINES LAUNCH DATE

Columbia will launch either September 5 or September 8; the date depends on how long it takes to fix a faulty electronic box in the cargo bay. If a cable on the electronics box can be rewired the launch will occur at 1:20 a.m. September 5. William Lenoir, Associate Administrator for Space Flight, said, "We think that's the most likely solution." If NASA is forced to replace a unit within the electronics box, the launch may be delayed until September 8. [Brown, **FLORIDA TODAY**, p. 1A, Sept. 1, 1990.]

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SPACEPORT USA ATTENDANCE

During this month, 361,805 persons visited Spaceport USA; this represented a 12.1% increase over August 1989. During 1990 year-to-date attendance stands at 2,312,102 visitors, while in 1989, year-to-date attendance was 2,224,387, an increase of 3.9%. ["Kennedy Space Center Spaceport USA Launches New Information Phone Number," **Spaceport USA News Release NTO575**, Sept. 4, 1990.]

SEPTEMBER

September 1:

ALS ROCKET ENGINE CHOSEN

The engine used to power the NASA/Air Force Advanced Launch System (ALS) will either be a gas generator power cycle similar to the engine used on the second and third stages of Saturn moon rockets or a closed expander power cycle, which is similar to engines used on unmanned rockets and Centaur Upper Stages. The Advanced Launch System is seen as a heavy-lift booster capable of carrying between 150,000 and 250,000 pounds into orbit while reducing launch costs to one-tenth of current prices. ["Rocket Engine Chosen for ALS," *FLORIDA TODAY*, p. 10E, Sept. 1, 1990.]

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COLUMBIA DELAYED, AGAIN

The launch of Columbia will be delayed, again. This time the delay is due to the need to test a replacement for the faulty electronics box in the Shuttle's cargo bay. "We're looking at this coming Thursday, Friday or Saturday," said NASA spokesman **Ed Campion**. The launch was delayed most recently because of the loss of communications with the X-Ray Telescope in Columbia's cargo bay. NASA had hoped the problem could be solved by replacing a cable on the electronics box that routes power from the Orbiter to the Telescope. When that didn't work, technicians replaced the entire electronics box which must now be tested.

Kennedy Space Center spokeswoman **Lisa Malone** said the new launch date depends upon how much testing is required. A new launch date will be announced September 2. NASA has until September 14 to launch Columbia; after that date, the mission will be delayed until after Discovery carries the Ulysses Planetary Probe into orbit in early October. Rollout for Discovery to Launch Complex 39B had been set for September 2 at 8 p.m. The move has now been delayed until no earlier than 8 p.m. September 4 because technicians in the Vehicle Assembly Building had difficulties making electrical connections between Discovery and its external tank. [Halvorson, *FLORIDA TODAY*, p. 1A, Sept. 2, 1990, "NASA Pushes Back Launch Date," *THE ORLANDO SENTINEL*, Sept. 2, 1990.]

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SMALLER SATELLITES RECOMMENDED

NASA should build several smaller, simpler spacecraft instead of the single large platform now planned for the second satellite of the \$30 billion Earth Observing System, according to a White House-appointed panel. NASA's current plans call for six huge, instrument-laden satellites to be built as

part of a system to monitor climate change on Earth. The space agency plans to begin launching the satellites in late 1997 or 1998.

In a special report requested by the White House, a National Research Council panel found that the system would leave a critical gap in efforts to measure the heating of the Earth's atmosphere in the 1990s. Smaller, less elaborate satellites would be less difficult to develop and could be launched sooner, filling the gap and also provide other critical data in the short term, the panel said. ["Panel: Use Smaller Satellites," *FLORIDA TODAY*, p. 10E, Sept. 2, 1990.]

September 2: COLUMBIA LAUNCH: SEPTEMBER 6

New electronics equipment installed over the weekend has taken care of the communications problem with Columbia's Astro-1 payload. Dick Young, Kennedy Space Center spokesman said, "They've got the link established now. "Countdown for launch will resume September 3 heading for a September 6 launch between 1:20 and 3:24 a.m. The STS-35 crew remained at KSC while repairs were made. The astronauts, who have been divided into two teams, will work around the clock throughout the 10-day mission. The crew includes Commander Vance Brand, Pilot Guy Gardner, Mission Specialists John "Mike" Lounge, Robert Parker and Jeffrey Hoffman and Payload Specialists Ronald Parise and Samuel Durrance.

Leaks found earlier in both Atlantis and Discovery have now been traced to seals that control the flow of propellants from the external fuel tank to the Orbiter's main engines. "We've surprised ourselves as we seem to do every time we do another test in the hydrogen world," said William Lenoir, Associate Administrator for Space Flight. He says now that the leaks both originated from the same type of fuel line seals. NASA suspects that tiny glass beads found in Columbia's fuel line damaged its seals; tests are being conducted to determine whether similar debris damaged Atlantis' fuel line seals. Although the cause of the leaks is still under investigation, NASA managers say they are confident the new fuel line installed in Columbia will not have the same problem. [Brown, *FLORIDA TODAY*, p. 2A, Sept. 1, 1990, Brown, *FLORIDA TODAY*, p. 1A, Sept. 3, 1990, "Glitches Fixed, Columbia Set for Thursday Launch," *THE ORLANDO SENTINEL*, Sept. 3, 1990.]

September 3: COLUMBIA'S COUNTDOWN BEGINS

Countdown for the launch of Columbia's STS-35 mission began again today. "We've had some trouble, but responding to trouble, fixing

problems, is our strong suit," said **Mike Leinbach**, NASA Test Director. "We've been disappointed several times, of course, but Thursday [September 6] morning we hope that is all behind us."

Columbia's mission was originally scheduled to launch in March 1986, but was delayed by the Challenger accident on January 28, 1986; a hydrogen leak scrubbed the May 30, 1990, launch attempt. A launch attempt last week was delayed because of problems with Astro-1's X-Ray Telescope. The telescope was resolved this past weekend when technicians repaired a faulty electronics package.

Liftoff is presently scheduled for 1:30 a.m. September 6, but could be moved up to 1:07 a.m. if problems force Shuttle Managers to switch the primary emergency landing site from Ben Guerir Air Base in Morocco to Moron Air Base in Spain. The exact launch time will be set by noon September 5.

"We want the Shuttle Columbia and the science payload to be right when we launch," said STS-35 Commander **Vance Brand**. "We are enthusiastic about the mission and ready to fly it." The remainder of the crew includes: Pilot **Guy Gardner**, Mission Specialists **John "Mike" Lounge**, **Jeffrey Hoffman** and **Robert Parker** and Payload Specialists **Robert Parise** and **Samuel Durrance**. [Halvorson, **FLORIDA TODAY**, p. 1A, Sept. 4, 1990.]

September 4: NEW INFORMATION PHONE NUMBER

Kennedy Space Center's Spaceport USA announced today that there is a new 900 telephone number for NASA Space Shuttle Launch information that is available in the continental United States at a cost of 75 cents per call. The new number is 1-900-321-LIFT OFF. **H. B. Chambers**, Division Vice President (TW Recreational Services, Inc.) and General Manager of Spaceport USA, said, "We feel the traveling public will appreciate being able to learn in advance about upcoming Space Shuttle launches that may occur during their Central Florida vacation. The Space Shuttle Information Line will provide an important visitor service." ["Kennedy Space Center Spaceport USA Launches New Information Phone Number," **Spaceport USA News Release NTO575**, Sept. 4, 1990.]

September 5: DISCOVERY ROLLS OUT

Discovery rolled out of the Vehicle Assembly Building at Kennedy Space Center at 6:47 p.m. last night and completed the eight-hour journey to Launch Complex 39B this morning at [about 2 o'clock]. The Orbiter is scheduled for launch October 5 and its cargo, the Ulysses space probe, must be launched between then and October 23 or be delayed for 13

months until the planets are once again properly aligned. In addition to the usual flight preparations, technicians at the pad will also try to find the cause of a 10 percent drop in the amount of coolant in one of Discovery's cooling lines. Columbia, now on Launch Complex 39A, had a similar problem that appears to have stabilized, according to NASA managers. [Brown, **FLORIDA TODAY**, p. 1B, Sept. 5, 1990.]



COLUMBIA GASSES UP TODAY

Final preparations for the launch of Columbia continue today as Columbia gets a full tank - 500,000 gallons - of propellant. "We're just proceeding down through the count, business as usual, doing what we do best," said **Al Sofge**, NASA Test Director. Project Manager **Bill Huddleston**, commenting on STS-35's troubled pre-launch history, said, "We've had our share of problems. I figure it's time to have something go right for Astro." [Halvorson, **FLORIDA TODAY**, p. 1A, Sept. 5, 1990, Glisch, **THE ORLANDO SENTINEL**, Sept. 5, 1990.]



COLUMBIA SCRUBS, AGAIN

At 5:40 p.m. today a leak of gaseous hydrogen 10 times the allowable limit was detected in Columbia's rear engine compartment. The leak was discovered less than an hour after the tanking process began. Columbia has been scrubbed again. "We're trying to figure out what we do from here," said Shuttle Program Director **Robert Crippen**. "It's really got us scratching our heads." Referring to the previous scrub because of leaks, Crippen said, "What we were dealing with were apparently two different leaks in May. I think we got fooled by the fact that we had two leaks. We think the leak has been there all along. It's a real bugger to try to find and isolate." He ordered a launch-pad tanking test for Discovery as soon as possible.

NASA planned to continue tests early tomorrow to pinpoint Columbia's newest seepage. At Pad 39A, technicians may enter the main engine compartment shortly for visual inspections. At Pad 39B, technicians plan to open Discovery's payload bay doors to begin resolving that Orbiter's cooling system problem. The amount of coolant has dropped by about 10 percent since the Shuttle left the Orbiter Processing Facility August 27 and, according to Kennedy Space Center spokesman **Bruce Buckingham**, Discovery continues to lose about 1 percent of coolant daily. [Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-7, Sept. 6, 1990, Halvorson and Brown, **FLORIDA TODAY**, pp. 1A-2A, Sept. 6, 1990, Kanamine & Halvorson, **USA TODAY**, p. 1A, Sept. 6, 1990, Broad, **THE NEW YORK TIMES**, p. A12, Sept. 6, 1990.]

September 6: COLUMBIA: FUEL PUMP REPLACEMENT

Technicians this weekend will replace a unit containing three engine fuel pumps aboard Columbia in hopes that the Shuttle will be safe and ready for launch the week of September 17. The Associate Administrator for Space Flight, **William Lenoir**, said, "It's unlikely to be any sooner than that, but it's not impossible. I think we have a shot at getting Astro off before Ulysses." A similar fuel pump leak postponed the flight of Atlantis for six days in the spring of 1989.

The source of the new leak is believed to lie in fuel pumps linked to the Orbiter's three main engines. Each engine has an electrically driven pump about the size of a softball that circulates liquid hydrogen through fuel lines, keeping them chilled and in proper condition for ignition. Engineers do not know which of the three circulation pumps are at fault.

Referring to the engine fuel pumps, NASA Administrator **Richard Truly**, said, "We are not certain [the fuel pump] is the cause. It's not a 100 percent guarantee. But it's the one shot we have to get the Astro mission safely airborne before the Ulysses flight." He added that the newest problem simply reflected the difficulty of space enterprise, and he appealed for the public's understanding. "The space program is not an ordinary business," he said. "It continually reaches out to do things that haven't been done before."

The Ulysses launch date itself is in question. A leak in Discovery's cooling system might force a delay in the October 5 launch of the Ulysses Solar Probe which must be launched by October 23 or wait 13 months for the next opportunity. Because NASA needs three weeks between missions to analyze flight data, the cutoff date for Columbia's launch had been September 14. Repairs to Discovery's cooling system may push back the Ulysses flight, giving the space agency a few more days to launch Columbia. [Broad, **THE NEW YORK TIMES**, p. A-11, Sept. 7, 1990, Brown, **FLORIDA TODAY**, p. 1A, Sept. 7, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-11, Sept. 7, 1990.]

September 7: PAD WORK CONTINUES

Leaks in two Space Shuttle systems have NASA contractor technicians working on 39A and 39B simultaneously. Columbia continues to be plagued by hydrogen leaks and Discovery has a coolant leak. "We're on the road to making repairs to Columbia so we can launch this month," said Kennedy Space Center spokeswoman. The launch of Columbia is targeted for the week of September 17.

Today technicians will climb into Discovery's cargo bay to gain access to the cooling system. On September 9, workers will test the cooling system to determine how bad the leak is. Discussion of the results will take place September 10. Among the options being considered are a complete overhaul of the system, which would imperil the chances of launching the Ulysses this year, refilling the leaky system just before launch; or flying the four-day mission with the plumbing as it is. [Banke, **FLORIDA TODAY**, p. 6A, Sept. 8, 1990.]

September 8: **KSC WATCHES TITAN 4 PROBE**

Alan Parrish, Director of Safety, Reliability, Maintainability and Quality Assurance, said today that every effort is made to ensure that the type of accident which occurred today in California with a Titan 4 does not occur in the Vehicle Assembly Building or other areas of Launch Complex 39. Parrish has been in touch with Air Force officials about the accident which killed one person and injured 9 others at Edwards Air Force Base in California. In that accident, a Titan 4 booster segment was dropped 100 feet and ignited upon hitting the ground at Edwards.

Parrish said that a Kennedy Space Center representative might serve on the investigative board the Air Force is forming, or as an official observer. The Air Force has expressed interest in how KSC operates and maintains its cranes used to lift the segments. NASA wants to learn more about the propellant used in the Titan 4 segment that was destroyed. The space agency is interested because the propellant combination is similar to what will be used on the Shuttle's Advanced Solid Rocket Motor, said Parrish. [Banke, **FLORIDA TODAY**, p. 6A, Sept. 9, 1990.]

September 9: **DISCOVERY CREW COMES TO KSC**

The crew of Discovery's STS-41 mission arrived at Kennedy Space Center early this afternoon to participate in a full dress rehearsal for the launch countdown which begins at 8 a.m. September 10. On arrival, Commander **Richard "Dick" Richards** commented, "We're happy to be here. This is a real milestone for us." Joining Richards at the traditional arrival ceremony were Pilot **Robert Cabana** and Mission Specialists **William Shepherd**, **Bruce Melnick** and **Thomas Akers**. Commander Richards added, "We still have some hurdles to overcome, but we're confident, come October, we're going to get Ulysses started on its five-year journey to the sun."

Managers must decide tomorrow (September 10) whether to top Discovery's cooling system with fresh coolant before launch and postpone repairs until Discovery returns from its four-day mission. The leak is

apparently confined to an external vent where it poses no contamination threat to the Ulysses Solar Probe in the cargo bay. While at Kennedy Space Center, the crew will be trained in emergency egress procedures at Launch Pad 39B including a practice drive in the M113 tracked vehicle. They will become familiar with the location of breathing apparatus at the pad, other emergency equipment and the slidewire basket system. [Brown, **FLORIDA TODAY**, p. 4A, Sept. 10, 1990, Banke, **FLORIDA TODAY**, p. 6A, Sept. 9, 1990, Malone, **KSC NEWS RELEASE NO. 154-90**, Sept. 7, 1990.]

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COLUMBIA: REPAIRS CONTINUE

NASA managers continue to hope that Columbia will be able to launch before Discovery's October STS-41 mission. Today, technicians replaced a suspect pump package in the main engine compartment with a spare unit. The new equipment will be tested September 10, according to Kennedy Space Center spokesman **Bruce Buckingham**. The old pump package will undergo testing at Johnson Space Center; the results of JSC tests will not be known to KSC managers until Columbia is refilled with fuel a few hours before flight. Buckingham said, "We're confident we can make the early part of next week." "The new launch date of Columbia is dependent on the successful replacement and re-test of the new packaged," according to **Lisa Malone**, KSC spokesperson. [Banke, **FLORIDA TODAY**, p. 6A, Sept. 9, 1990, Brown, **FLORIDA TODAY**, p. 4A, Sept. 10, 1990.]

September 10: RECIRCULATION PUMP INSTALLATION

The new hydrogen recirculation pump package is being installed today and leak checks are planned for this afternoon. Late tonight, engineers will conduct a helium signature test of the liquid hydrogen side of the main propulsion system and main engines. Following the test, technicians will again foam the pump and connecting joints. No leaks were detected during tests of the pump package this weekend. [**KSC SHUTTLE STATUS REPORT**, Sept. 10, 1990.]

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DISCOVERY'S PRESSURIZATION TEST

Results from a pressurization test of the freon system aboard Discovery are being analyzed today. This test is designed to verify structural integrity of the system. A leak was detected in the system after the vehicle was in the vertical position. A helium signature leak test of the three main engines and main propulsion system was successfully completed overnight. The Countdown Demonstration Test began on time today at 8 a.m. at the T-24 hour mark. All countdown events will be simulated or

abbreviated leading up to a main engine cutoff at about 11 a.m. tomorrow.
[KSC SHUTTLE STATUS REPORT, Sept. 10, 1990.]

September 11:

DISCOVERY LAUNCH DATE

Today NASA managers are expected to announce when Discovery will fly in October or whether a lengthy repair effort will be needed. Tests on the leak of a coolant from an emergency cooling system have been inconclusive, according to Kennedy Space Center spokesman **Bruce Buckingham**. Managers are thought to be leaning toward topping off the coolant system's fuel supply and flying Discovery as is. Discovery Commander **Richard "Dick" Richards** said, "We want to make this mission a success. At the same time, we can't just sacrifice safety in order to make that happen at any cost. I'm hoping that as long as we keep making the right decisions, we're going to turn around. Two years from now, we won't remember these hydrogen leaks. They'll be just a footnote in the Shuttle history." [Brown, **FLORIDA TODAY**, p. 3A, Sept. 11, 1990.]

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SEPTEMBER 18 FOR COLUMBIA

Despite there being only a 50-50 chance that the source of Columbia's hydrogen leak has been found, NASA announced a tentative launch date for the STS-35 mission of September 18; liftoff would occur between 1:28 a.m. and 3:07 a.m. "We are doing everything we can to try and find this leak and to fix it," said **Bascom Murrah**, NASA Processing Manager. "I can't give you any guarantees that we have fixed it." Murrah referred to the replacement over the weekend of a package of fuel pumps suspected of being the culprit in Columbia's latest hydrogen leak. Because the work took longer than anticipated, the helium signature test of the hydrogen side of the main engines and main propulsion system was rescheduled from late September 10 to second shift today.

The September 18 launch date may be subject to change because on September 17 - a Monday - the Air Force plans to launch a top-secret Titan 4. Officials for the Air Force said 36 to 48 hours between launches are needed to reset launch support equipment. NASA spokesman **Ed Campion** said that a final decision on Columbia's liftoff may come September 12. If launch does not occur next week, Columbia will have to wait until after Discovery's October launch. [Diller, **KSC STATUS REPORT**, Sept. 11, 1990, Banke, **FLORIDA TODAY**, p. 1A, Sept. 12, 1990, Banke, **FLORIDA TODAY**, p. 1A, Sept. 13, 1990.]

DISCOVERY: "GOOD COUNTDOWN TEST"

"As usual, we had a good countdown test. Overall things went real smooth. We'd like to see things go that way for the real thing," said Lisa Malone, Kennedy Space Center spokesperson. Discovery's five-man crew was aboard for the final hours of the rehearsal which ended at 11:07 this morning. An exact launch date for the STS-41 mission must await NASA's decision on what to do about a cooling system leak in the Orbiter's cargo bay. It is anticipated that problems related to the leak will delay the launch two or three days from the target date of October 5.

Today's successful countdown dress rehearsal was primarily an electrical test of the Space Shuttle systems and launch complex systems, and a procedural exercise for the astronauts working together with the launch team. In parallel with the countdown test, the payload test team conducted an exercise to simulate problems which could arise during an actual countdown. The test team's decisions on managing unexpected problems which could arise with Ulysses, the Inertial Upper Stage, or the Payload Assist Module were to be discussed after the test.

Data from the testing of Discovery's cooling system over the weekend shows that the small freon leak is not likely to worsen and that flying as is will be the Kennedy Space Center recommendation. The leak will continue to be monitored, however, the leakage rate of about 1% per day is believed not likely to change. The next major step toward launch began this afternoon with the Interface Verification Test between Ulysses with its attached upper stages and Discovery. This test verifies the electrical connections established between the payload and the orbiter, and also connections with the payload control panel and the associated computers on the flight deck. [Diller, KSC STATUS REPORT, Sept. 11, 1990, Banke, FLORIDA TODAY, p. 9A, Sept. 12, 1990.]

September 12: HELIUM LEAK TEST COMPLETED

A helium signature leak test of Columbia's liquid hydrogen system was successfully completed early this morning. Overnight, technicians replaced a damaged teflon seal for the engine 3 pre-valve. Part of the investigation of the hydrogen leak involved leak tests of the engine pre-valves. Tests performed over the past weekend indicated a leak just over specification at that particular cover seal. The two and a half inch diameter seal was replaced September 11 by the vendor. NASA officials believe the damaged seal was the cause of the high concentrations of hydrogen detected in the aft compartment during the previous launch attempts of Columbia. Closeouts of the aft compartment are scheduled to begin later tonight.

Launch countdown preparations will begin tomorrow. [Malone, KSC SHUTTLE STATUS REPORT, Sept. 12, 1990, Glisch, THE ORLANDO SENTINEL, Sept. 13, 1990.]



LEAK CULPRIT: DAMAGED SEAL

Columbia was scrubbed September 5 when high concentrations of liquid hydrogen were detected in the aft compartment of Columbia. Subsequent tests showed the leak came from the vicinity of the recirculation pump package. During leak check operations following installation of the new recirculation pump package, technicians found a crushed seal on the prevalve of the main propulsion system. The seal is part of a detent cover. The prevalve is the main hydrogen valve which supplies hydrogen to Space Shuttle Main Engine Number 3. The detent holds the prevalve in place in the open position.

Helium leak checks indicated the seal was within specification, however, this particular detent cover had an order of magnitude greater leak than other detent covers. Alert technicians and engineers decided to investigate further and discovered the damaged seal. Engineers believe the location of the seal and the damage to the seal make it a prime suspect as the cause of the hydrogen concentrations seen in the aft of Columbia during tanking operations. They believe the seal was damaged during the post-inspection installation and remained undiscovered until yesterday. [Banke, FLORIDA TODAY, p. 1A, Sept. 13, 1990, Banke, FLORIDA TODAY, p. 5A, Sept. 13, 1990, Campion and Malone, "Launch Advisory for Shuttle Missions STS-35 and STS-41," KSC NEWS RELEASE (no number), Sept. 12, 1990.]



COOLING SYSTEM OK'D FOR FLIGHT

Discovery's freon cooling loop number 1, which has given indications of a small leak since leaving the Orbiter Processing Facility, has undergone special testing. After review of the test data, Shuttle managers have determined that this condition can be safely flown in its present state. Launch preparations will include topping off the freon system of Discovery a few days before launch which will keep the freon level well above the amount needed to support Shuttle operations during the 4-day mission. An interface verification test for the Ulysses payload has been completed and preparations for the end-to-end test are underway; that test will be made tomorrow. Preparations are underway for loading hypergolic propellants aboard the Orbiter this weekend. The pad will be closed to all non-essential personnel for this tanking operation. [Banke, FLORIDA TODAY, p. 1A, Sept. 13, 1990, Campion and Malone, "Launch Advisory for Shuttle Missions STS-35 and STS-41," KSC NEWS RELEASE (no

number), Sept. 12, 1990, KSC SHUTTLE STATUS REPORT, Sept. 12, 1990.]

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ATLANTIS PROCESSING

Operations to replace the flash evaporator aboard Atlantis are continuing. Brazing operations are scheduled today. Tile repairs continue and thermal control blankets are being installed on the forward bulkhead. [KSC SHUTTLE STATUS REPORT, Sept. 12, 1990.]

September 13: SEARCH FOR LEAKS CONTINUES

NASA has not abandoned its search for fuel line leaks even though a damaged seal suspected of causing last week's scrub of the STS-35 Columbia mission has been replaced. "There is no question that this seal was leaking," said **Forrest S. McCartney**, Director of Kennedy Space Center. He went on to indicate that the damaged seal might not be the sole source of Columbia's latest leak. "I think we found it, but the data could be interpreted to say there also may be another one, so our people are looking into it," McCartney said.

The engines themselves are not thought to be leaking, according to KSC spokesman **Bruce Buckingham**. The problem, he said, is the plumbing between the engines and the external tank. "The bottom line is that you really don't know until you begin filling the tank," he said. NASA spokesman **James Hartsfield** said, "There's a little bit of doubt on how much that damaged seal contributed to the leak." Tanking will begin about 5 p.m. September 17 with launch coming between 1 a.m. and 3:30 a.m. the next morning, September 18. A faulty temperature sensor that allowed hydrogen to leak near one of Columbia's three main engines was replaced today. [Banke, **FLORIDA TODAY**, p. 7A, Sept. 14, 1990, Banke, **FLORIDA TODAY**, p. 1A, Sept. 15, 1990.]

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HUBBLE INVESTIGATION REPORT

The following is a statement of Dr. Lew Allen, Chairman of the Hubble Space Telescope Optical Systems Board of Investigation at the conclusion of the board's fourth meeting, held yesterday and today, at Hughes Danbury Optical Systems, Inc. (Danbury, CT):

"I wish to report that the Board has nearly completed answering the 3 questions of its basic charter - to ascertain: what happened to result in the Hubble Space Telescope Optical Telescope Assembly problem; how it occurred; and how it escaped notice until after launch. The Board has just

completed its fourth meeting, the third at Hughes Danbury Optical Systems, Inc., Danbury, Connecticut, previously Perkin Elmer, where the HST mirrors were made. In terms of the first issue - what happened - the Board is confident that most, if not all, of the on-orbit problem can be tracked to a spacing error in the reflective null corrector, an optical reference device used in the manufacture of the primary mirror.

"With respect to the second point in the Board's charter - how the mistake occurred - the Board is fairly confident that it has identified this as well. The process has been greatly facilitated by the fact that almost all of the hardware involved in the fabrication of the primary mirror has been available for examination and analysis by the Board. In addition, many of the individuals originally involved in the construction of the reflective null corrector have come to Danbury where, with Dr. Robert Parks, the Board's representative at HDOS, and current HSOS personnel, they have reconstructed for the Board the events in the assembly of the null corrector.

"After its successful use in Perkin Elmer's initial demonstration program, the reflective null corrector required respacing before use with the HST primary mirror. The process of this respacing was done with the most precise means possible - using metering bars (also called "metering rods") and interferometric measurements relative to optical foci, as opposed to other techniques such as those employing micrometers and mechanical measurements.

"The metering bars were used by reflecting a focused beam of light off their ends. To ensure that the beam of light was reflected off the very center of the bar's end, a field stop, or end cap, was used with a "pin-hole" in its center to hold the light beam centered. It appears now that there was a reflective region around the pin-hole and that the light beam was reflected off that surface rather than the end of the metering bar, introducing a difference of about 1.3 mm. The likelihood of this type of problem causing the null corrector spacing error was increased by the fact that the two ends of the metering bars are slightly different and there is strong evidence that the bar was used in an inverted position.

"Aspects of the above scenario have been reproduced with an interferometer and metering bar/end cap simulation, and the results indicate that the scenario as described is probable. In terms of the Board's third charge - to determine how the problem with the HST OTA could have gone undetected until after launch - it must be noted that the assembly of the null corrector involved many precise and subtle steps. Although the process was carried out by highly skilled individuals, it is now apparent that a mistake occurred and was not detected. As the Board

concludes its report, it will address the question of various indications existing during the mirror manufacture process which could have revealed the problem but weren't recognized properly at the time. I expect that the final report now in preparation will be ready as anticipated by the beginning of November. It appears that the Board has obtained the necessary data to reconstruct the events which led to the manufacturing error." [Cleggett-Haleim, NASA NEWS RELEASE, Sept. 13, 1990.]

September 14:

COUNTDOWN ON SCHEDULE

Launch preparations for STS-35 continued without a problem today leading up to the beginning of countdown tomorrow. "We've been right on schedule," said Kennedy Space Center spokeswoman **Lisa Malone**. Additional leak tests of the main propulsion system and the number 2 main engine were successfully performed yesterday and no further testing is required. Technicians also purged the power reactant storage and distribution system storage tanks yesterday.

Closeouts of the aft compartment for flight are continuing today. These activities include inspections of the hydraulic systems, draining condensation from the flash evaporator, removing protective covers from components, installing a baggie on a fuel duct, installing gas samplers, taking closeout photos and overall cleaning. These activities are scheduled to be completed tomorrow and the flight doors will be installed on the vehicle by tomorrow afternoon. [Banke, **FLORIDA TODAY**, p. 1A, Sept. 15, 1990, **KSC SHUTTLE STATUS REPORT**, Sept. 14, 1990.]

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LAUNCH PARKING LIMITED

People with NASA car passes won't get as close to Launch Complex 39A as normal because of the imminent launch of a secret Titan 4 mission from Cape Canaveral Air Force Station. For Columbia's liftoff, visitors will be directed to a site west of Spaceport USA, just east of Kennedy Space Center's Gate 3 and about 10 to 12 miles southwest of 39A. Officially, NASA said only that the change in viewing sites was "due to range activities."

The Air Force's Capt. Ken Warren, however, explained the change this way: "The Shuttle will be overflying systems in launch-ready condition with fuel and oxidizers on board. Due to the presence of those substances, the usual viewing areas on the NASA Causeway are within a zone that possibly would not be safe in the event of a contingency involving the Shuttle." The Titan 4 is being readied for a liftoff from Launch Complex

41 two days after STS-35 begins. [Halvorson, **FLORIDA TODAY**, p. 5A, Sept. 15, 1990.]

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MCCARTNEY: NATIONAL QUALITY MONTH

In 1984, as a public awareness campaign, a joint resolution of Congress and a proclamation by President Reagan declared October as National Quality Month. In 1989, President Bush renewed this presidential proclamation. This campaign is to stimulate, support, and strengthen this Nation's commitment to quality.

Through special activities, KSC calls attention to quality improvement as the best strategy for increasing our competitiveness. Enclosed is a schedule of events that will be happening at KSC in our observance of this tradition. I encourage each of you, with permission of your supervisor, to attend one or more of these events. In all our activities at KSC, quality is the most important product. We will continue to be in the forefront of the quality movement within the Federal Government. October, National Quality Month, is an appropriate time for each of us to reaffirm our commitment and dedication in maintaining our excellence. [McCartney, Forrest S., "Memorandum to KSC Employees," Sept. 14, 1990.]

September 15: COLUMBIA PROBLEM "SOLVED"

"Hopefully, we have it [the hydrogen leak problem] solved. We think we do, but we thought we did before," said Kennedy Space Center Director Forrest S. McCartney today. Columbia is scheduled to make its fourth attempt to begin its STS-35 mission on September 18 at 1:28 a.m. McCartney said that even if a launch-delaying leak shows up again this time, the launch team would not flinch before halting the countdown a fourth time. The most frustrating thing I can think of is losing an Orbiter and what the country does after that. So if you want to know what pressure is, pressure is trying to be sure that we continue to take all risks into account," said McCartney. [Banke, **FLORIDA TODAY**, pp. 1A-2A, Sept. 16, 1990.]

September 16: COLUMBIA: TANKING TODAY

Technicians at Launch Complex 39A today will begin pumping liquid hydrogen and liquid oxygen into Columbia at the rate of 8,400 gallons per minute today at 4:57 p.m. NASA Test Director Mike Leinbach said that, "Historically, that is the time leaks have occurred. "We feel real good that we have fixed the leaks, and we don't expect one, but it will be about 45

minutes after we begin filling the tank before we're positive we've fixed the leaks."

Five of Columbia's astronauts arrived at Kennedy Space Center on Saturday; these included Commander **Vance Brand**, Pilot **Guy Gardner**, Mission Specialist **Jeffrey Hoffman** and Payload Specialists **Ronald Parise** and **Samuel Durrance**. Mission Specialists **John "Mike" Lounge** and **Robert Parker** arrived today. Air Force meteorologists are predicting an 80 percent favorable chance for launch early Tuesday; liftoff is scheduled for 1:38 a.m. September 18. [Halvorson, **FLORIDA TODAY**, p. 1A, Sept. 17, 1990, "Fueling Test On Monday Will Test Shuttle Leak," **THE ORLANDO SENTINEL**, Sept. 16, 1990, Glisch, **THE ORLANDO SENTINEL**, p. A-3, Sept. 17, 1990.]

September 17: **COLUMBIA GROUNDED, AGAIN**

"We are no go for launch tonight," said **Lisa Malone**, spokeswoman for Kennedy Space Center in announcing the scrubbing of the STS-35 mission for the fourth time. It is unclear when and if Columbia will fly again. Columbia will not fly until November at the earliest, according to Shuttle Program Director **Robert Crippen**. "At this time we are scrubbed. The next flight up is Ulysses," said Crippen at a press conference begun at 9:00 p.m. tonight after Columbia's STS-35 mission was scrubbed for the fourth time. The launch was scrubbed at 6:35 p.m. after the tanking operation of liquid hydrogen transitioned from the "slow-fill" to the "fast-fill" mode.

Columbia's fueling operation began at 5:45 p.m., an hour later than planned due to nearby thunderstorms. The leak in the Orbiter's rear [aft] engine compartment came about four minutes after into the tanking operation. The two previous leaks were discovered at about the same time. Levels of hydrogen gas in Columbia's aft compartment - a potentially explosive leak - reached 3,500 parts per million before the scrub. NASA launch rules limit hydrogen levels to 1,000 parts per million while the external tank is being filled.

The launch team continued troubleshooting the source of the leak for the remainder of the evening. Engineers are analyzing the data collected. There is a possibility of conducting another tanking test. The details and date of the test are being discussed. "The mood is really depressing, especially after trying to chase these leaks all summer," said **Keith Hudkins**, Director of NASA's Shuttle Orbiter Division. "I think the team ultimately will solve this problem, but we won't launch Columbia until the leak is fixed." [Banke and Halvorson, **FLORIDA TODAY**, pp. 1A-2A, Sept. 18, 1990, "KSC Shuttle Status Report," Sept. 18, 1990, Halvorson and Hall,

USA TODAY, p. 1A, Sept. 18, 1990. Broad, THE NEW YORK TIMES, p. B9, Sept. 18, 1990, Glisch, THE ORLANDO SENTINEL, pp. A-1 & A-13, Sept. 18, 1990.]

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LEAK SUSPECT: IMPROPER REPAIR WORK

NASA has a prime suspect for the cause of today's leak: Officials think that work which required removing and replacing parts of the main propulsion system might have been done improperly and may have caused the leak. Two previous leaks were traced to contamination in part of a 17-inch-wide fuel pipeline and a crushed seal in a valve near one of the Orbiter's main engines. Officials believe the seal was probably crushed after it and other plumbing were removed and replaced after the contamination was noticed. The contamination was corundum, residue from a type of sandpaper used to refurbish the mobile launch platform for Columbia's January mission, according to Shuttle Program Director Robert Crippen. "The best guess we have today is somehow we left a small amount of this grit paper in the system and that got sucked into the vehicle in the process of fueling it," said Crippen. The platform had last been used for the Apollo-Soyuz flight in 1975. [Banke and Halvorson, FLORIDA TODAY, pp. 1A-2A, Sept. 18, 1990, Broad, THE NEW YORK TIMES, p. A-14, Sept. 19, 1990, Kanamine and Banke, USA TODAY, p. 3A, Sept. 19, 1990, Banke and Brown, FLORIDA TODAY, pp. 1A-2A, Sept. 19, 1990.]

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COLUMBIA'S SCRUB: NORMAN PARMET

Norman Parmet, Chairman of NASA'S Aerospace Safety Advisory Panel, called the reappearance of hydrogen leaks in Columbia's aft engine compartment a disturbing development but said NASA was correct to halt the mission. "I don't care how long it takes, they ought to systematically take the approach to try to find what the basic cause of all these leaks are." Somebody missed something somewhere." He suggested, further, that Columbia may be suffering from again hardware prone to leaks and other problems despite having flown only nine times. "It's not the flying aspect, but the time aspect that is the important thing. If you let an airplane sit for long periods of time, you're going to get leaks all over the place," Parmet said. "Not being used can create situations for leaks when seals dry out and stuff like that. I'd tell them to go back to ground zero and check everything they have done." [Banke and Halvorson, FLORIDA TODAY, pp. 1A-2A, Sept. 18, 1990.]

PLAYALINDA BEACH ROAD

Construction may begin this fall on the new road to Playalinda Beach; permits have been obtained and bids for the project have been opened. The new road was made necessary by the need to provide beach access which was outside Kennedy Space Center's three-mile security zone. Currently, the only access road to the beach for Titusville, FL, residents is closed when an Orbiter is on Launch Pad 39B or when a Shuttle is being flown back to the Space Center following a California landing.

Peggy DeWeese, federal highway engineer, said Speegle Construction Co. (Cocoa, FL) has submitted the lowest bid, \$3.9 million, but that the contract had not yet been awarded. "We look at price, responsiveness and responsibility," she said. "The company that will receive the project has to fulfill the essential contract requirements and be qualified to do the work. We have to make sure the price they bid will allow them to do the work." The project is scheduled for completion in January 1993. When completed, there will be year-round access to Playalinda Beach. [Long, **FLORIDA TODAY**, p. 1B, Sept. 18, 1990.]

September 18:

LEAK SEARCH TO CONTINUE

Today pad technicians will complete the draining of propellants from Columbia's external tank and prepare to enter the Orbiter's aft compartment to identify and isolate the source of yesterday's hydrogen leak. The Rotating Service Structure was moved back around the vehicle at about 9:15 a.m. this morning. The Orbiter Midbody Umbilical Unit has been reconnected to the vehicle in preparation for offloading the onboard reactants. The payload bay doors will open September 19. Any repairs needed by Columbia will very likely be done on the pad. Shuttle Program Director **Robert Crippen** said in last night's press conference that NASA had no reason to think Discovery would be affected by the same types of leaks which grounded Columbia and Atlantis. Nevertheless, a special launch pad fuel test is being considered to assure that Discovery does not have the same type of leak. The STS-35 crew left Kennedy Space Center today at 11 a.m. and returned to the Johnson Space Center for further training.

Commander **Vance Brand** spoke for the rest of the crew before his departure: "The STS-35 crew, naturally, was disappointed not to launch last night. However, most of us have been involved in the space flight business for some time, and we know from experience that hardware problems can be difficult and it does not pay to fly until the spacecraft is ready. The Astro-1 astronomy mission is very worthwhile, and the crew

is ready and anxious to fly as soon as the remaining hydrogen leaks are repaired. [Banke and Halvorson, **FLORIDA TODAY**, pp. 1A-2A, Sept. 18, 1990, "Statement by STS-35 Commander Vance Brand," Sept. 18, 1990, **KSC Shuttle Status Report**," Sept. 18, 1990.]

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KSC MORALE

"What we're going through here is disappointment we didn't get to launch it. It's not the sadness and grief [of the Challenger accident]," said Kennedy Space Center Director **Forrest S. McCartney** about the fourth scrubbing of the STS-35 mission. "On the other hand, we're not going to fly that machine, or any of them, until we have things working. The bird's a good bird." NASA engineers insist that Columbia's problems are not due to a design flaw. Former Administrator James Fletcher's advice to the agency he headed until 1989 was: "Take your time, fix the leaks and we'll go when we're ready." Shuttle Program Director **Robert Crippen** said that NASA will "keep trying until we get it right." [Kanamine and Banke, **USA TODAY**, p. 3A, Sept. 19, 1990.]

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COLUMBIA STATUS REPORT

Shuttle officials are continuing to analyze data from yesterday's tanking operation. A small investigation team is being formed to determine the source of the leak which caused the STS-35 mission to be scrubbed. The team will be headed by **Robert Schwinghamer** (MSFC) and will operate from Kennedy Space Center. Several in-house teams are being formed at KSC to analyze data from last night's operations and from previous tests and to determine requirements for another tanking test. Additionally, the team will review all work performed on Columbia's main propulsion system since Columbia's last flight, STS-32 in January of this year.

The source of the leak has not yet been pinpointed, however data collected suggests that the engine 2 liquid hydrogen recirculation system is making a contribution to the leakage detected. Officials are discussing the troubleshooting test results and will determine whether and when further testing will occur. Currently, officials are planning to conduct a liquid hydrogen tanking test on Columbia with the aid of additional instrumentation and television cameras. Details remain to be discussed.

At pad 39A, hydrogen boiloff operations continued into the evening. A purge of the tank will follow the boiloff. Later, the power reactant storage and distribution system storage tanks will be drained of liquid hydrogen and liquid oxygen reactants. Access to the aft compartment area should come no earlier than late tomorrow (September 19) afternoon. [Malone,

KSC Shuttle Status Report - Tuesday, Sept. 18, 1990, 5:30 p.m.; Afternoon Status - STS-35 - Columbia (OV 102) - Pad 39A, Glisch, THE ORLANDO SENTINEL, Sept. 19, 1990.]

September 19:

TITAN LAUNCH POSTPONED

The launch of a Titan 4 rocket was postponed today for 24 to 48 hours because of technical problems encountered during countdown. Liftoff of the Titan is expected to take place between 12:01 a.m. and 1:30 a.m. September 21 or September 22. The rocket is carrying a Department of Defense payload. ["Titan Liftoff Postponed A Day or Two," FLORIDA TODAY, p. 1A, Sept. 20, 1990.]

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COLUMBIA'S LAUNCH DATE

NASA does not expect to launch Columbia now until late November or December by which time both Discovery and Atlantis will have launched, agency officials said today. The officials also said Endeavour may provide yet another part to Columbia before a special pad test can be conducted. That test will come no earlier than the middle of next week and may not occur until after Discovery's launch scheduled for October 5.

The leak investigation continued today as engineers ordered the replacement of a fuel-line valve within the aft compartment of Columbia. The valve, which had been taken from Endeavour, was said to be sluggish in closing after the most recent failed launch attempt. Lisa Malone, Kennedy Space Center spokeswoman, said that spares might already be on hand at KSC or at a contractor facility in Cape Canaveral but that Endeavour is considered a likely donor.

Columbia's leaks are believed to have been caused by damage sustained in the aft compartment when pad technicians cleaned and replaced contaminated parts earlier in the year. These parts were contaminated with corundum, a metal polishing abrasive used in modifying the Apollo-era mobile platform used for Columbia's last launch in January. The contaminant was found during final launch platform inspections in 1989 and the entire platform was hosed off to remove the residue, according to Bob Ward, KSC Fluid Systems Manager.

It is thought that some corundum in the launch platform's tail service mast must have escaped the cleanup job and found its way into Columbia's aft compartment when Columbia was fueled for launch in January, according to Ward. Lockheed Space Operations Co. (Titusville, FL), according to company spokesman J. B. Clump, was responsible for the final installation

and check of the tail service mast, which carries fuel and electrical lines to the Shuttle. NASA, however, was responsible for overseeing the final inspections of operations. [Banke, **FLORIDA TODAY**, p. 1A-2A, Sept. 20, 1990.]

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LEAK INVESTIGATION TEAM NAMED

Robert L. Crippen, Space Shuttle Program Director, announced today that he had formed a Hydrogen Leak Investigation Team to locate and solve the hydrogen leak problem on the Orbiter Columbia which forced the postponement of the STS-35 mission. Crippen named **Robert Schwinghamer**, Deputy Director for Space Transportation Systems, Science and Engineering Directorate at the Marshall Space Flight Center to lead the team. Other members include **A. L. Worlund**, Deputy Director, Propulsion Laboratory, MSFC; **Chester Vaughan**, Chief, Propulsion and Power Division, Johnson Space Center; **Warren Wiley**, Deputy Director, Vehicle Engineering, KSC; **Horace Lamberth**, Chief Engineer, Lockheed Space Operations Co., KSC; **Steve Cavanaugh**, Director of Propulsion/Fluid Systems, Space Systems Division, Rockwell International; **Paul F. Seitz**, Deputy Chief Program Engineer, Space Shuttle Main Engine, Rocketdyne Division, Rockwell International; **John R. Cool**, Manager, Pressurization Systems, Martin Marietta Manned Space Systems; **Dr. Michael Greenfield**, Director, Systems Assessment Division, Office of Safety and Mission Quality, NASA.

"The team will be based out of Kennedy Space Center and will devote full time to solving this problem," Crippen said. "They will report directly to me, and I've asked the Space Shuttle Program to provide Mr. Schwinghamer and his team every available assistance to aid in solving this critical problem." NASA officials said that the investigative team and its technical aides would work around the clock seven days a week to solve the problem. [Campion, **NASA NEWS RELEASE NO. 90-127**, Sept. 19, 1990, Broad, **THE NEW YORK TIMES**, p. A11, Sept. 21, 1990.]

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COLUMBIA STATUS

Workers gained access to the aft compartment of Columbia today and have begun preliminary inspections. Foam will be removed from around valves, actuators and areas of the recirculation pump package to allow further inspections and tests. Details and requirements are being identified for a tanking test. A definite date for the test has not yet been set. Propellant tanks for the orbital maneuvering system and reaction control system will be depressurized tomorrow night. Ordnance devices were to be disconnected early on September 20. Preparations to remove auxiliary

power unit 2 are scheduled to begin tomorrow and the unit will be installed on Atlantis this weekend. [KSC SHUTTLE STATUS REPORT, Sept. 20, 1990.]

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COLUMBIA: 1991?

"Our current planning is based on the assumption that Discovery and Atlantis are operational. Columbia is grounded," said William Lenoir, Associate Administrator for Space Flight. Columbia will remain on the pad until its fuel leaks are found and fixed. The Shuttle had been scheduled to fly two Spacelab missions before the end of 1990. Now, one of those missions may come between November and February. "We have no target dates for any Columbia mission," said Associate Administrator for Space Flight William Lenoir at a news conference in Washington.

NASA's plan for the remainder of 1990 looks toward a Discovery launch anywhere from October 6 through October 9. The launch date will be announced following next week's flight readiness review. Because there is no leak history on Discovery, a special launch pad fueling test will not take place. Two days after Discovery's launch Columbia will be moved from Pad 39A to Pad 39B where it will undergo leak investigations and repairs.

Atlantis is scheduled for launch from Pad 39A in early November. Unlike Discovery, Atlantis will undergo a leak test to ensure that the fuel line leak which grounded the Orbiter in mid-july has been corrected. [Banke, **FLORIDA TODAY**, p. 1A, Sept. 21, 1990, Broad, **THE NEW YORK TIMES**, p. A11, Sept. 21, 1990, KSC SHUTTLE STATUS REPORT, Sept. 19, 1990.]

September 21:

DISCOVERY STATUS

Final securing of the high pressure turbo pump fuel duct on main engine 2 is scheduled to be completed this afternoon. A flight readiness test of the main engines is planned later this evening and a partial helium signature test is set for late today or early tomorrow to check the new duct. Flight batteries for the Ulysses Inertial Upper Stage are scheduled to be installed today. As a precautionary measure, leak checks and inspections of cover seals for the engine pre-valves are planned later today. These seals were replaced as required since Discovery's last flight. Discovery and the Ulysses Spacecraft are being prepared for an October 5 launch of the STS-41 mission. [KSC SHUTTLE STATUS REPORT, Sept. 20, 1990.]

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RUSHED DECISIONS POOR: NASA

NASA managers said today that they rushed some decisions on Columbia and these resulted in poor decisions. "We decided to take a quick look [at Columbia's fuel leak problems], take our best shot at it and see if we were right," said Associate Administrator for Space Flight **William Lenoir**. "Ulysses was driving us all along. We had the line in the sand - Ulysses - that couldn't slip because of its launch window. We were anxious first to get two flights off before Ulysses, and when that wouldn't work, at least one. And now we are down to none."

The space agency conceded that it decided Columbia had only one leak - in the 17-inch disconnect fuel line - despite test data suggesting a second leak. The second leak showed itself clearly on the Sept. 5 launch attempt; the second leak has been attributed to contamination by corundum, a metal-polishing abrasive used to clean an Apollo-era launch platform.

Shuttle Program Director **Robert Crippen** said subsequent to the September 17 scrub of a Columbia launch attempt that more rigorous inspections should have been made in the Orbiter's rear compartment after Columbia's first launch postponement in May. "We had asked the team to go look into the aft compartment to see if we could find another leak, and they did that. If we did something improper, it was we didn't do that as diligently as I now wished we had done."

As a result of the leaks in Columbia and Atlantis this summer, NASA has decided to review: processing procedures to ensure Shuttle hardware is not damaged when being readied for flight; test procedures to ensure leaky parts are not accepted for flight; the manner in which the search for leaks has been managed. Lenoir said, "We put some rules in place to make sure we couldn't violate safety, but then we got rushed and we didn't have the chance to stand back, take the global look and do the real broad-based engineering. We more or less defaulted into a 'Hey, I think it's this. Let's fix this and then see if it is.' It has led us astray more than once." [Banke, **FLORIDA TODAY**, pp. 1A-2A, Sept. 22, 1990.]

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RECORDS MANAGERS MEET

During the week of September 17-21, five representatives from the National Archives and Records Administration (NARA), accompanied by the NASA Records Management Officer, conducted a review of the KSC Records Management Program. They were highly impressed with the scope of the KSC records management program and the total integration of government records management by the contractor and the civil service

work force. NARA was very supportive of the proposals made by the KSC Tape/Records Storage and Retention Working Group for timely disposition of Shuttle and Payload processing records. They agreed to expeditiously process requests for destruction and/or retirement of large volumes of paper records which were previously "unscheduled", and for the erasure of certain data tapes and the retention of valuable master tapes for the life of the Shuttle Program. All local participants were very supportive of this review, including the Working Group, contractor and civil service Records Control Officers, KSC Archives, and organizations supporting tours for the NARA visitors. [Weekly Notes, SI-SAT-5, Sept. 28, 1990.]

September 22:

ULYSSES PROTESTED

Kennedy Space Center was the site of yet another protest rally today as an estimate 150 persons met at the space center's main entrance gate on State Road 405 (Titusville, FL); the group subsequently drove to Spaceport USA, then walked about a mile to the main guard gate near KSC's Headquarters Building. The protestors, given warnings by security guards, did not try to cross into the restricted area. They did deliver petitions, articles and other papers to KSC Security Patrol Chief **Jim Morris**.

Protest organizer **Bruce Gagnon** said, "There are alternatives to putting nuclear power into space. It's not that we think Ulysses will blow up. But as we launch more and more of these things, we open ourselves up to an accident that we will all live to regret." **Daniel Hirsch**, President of the Committee to Bridge the Gap, added, "We're urging NASA to reassess its reliance on nuclear power in space. The choice is not between launching this with the risk or not launching. The choice is whether we're going to start following a different set of values, where the environment is placed No. 1 and dollars and expediency are ranked No. 2 and 3."

NASA spokesman **Karl Kristofferson** said, "There's no doubt that plutonium is a very, very toxic substance, but we're not talking about a nuclear reactor here. These things don't explode. It would take a very, very worst-case scenario to crack open a plutonium pellet, which is in a ceramic form. It is extremely unlikely that it can be pulverized. Alternate technologies and power sources are probably feasible, but it would require complete redesign and testing, which could put off planetary launches well into the next decade." [Brown, **FLORIDA TODAY**, pp. 1A-2A, Sept. 23, 1990.]

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DISCOVERY LAUNCH PREPARATIONS

Discovery underwent launch preparations this weekend a few miles from where a protest against its Ulysses mission took place (see above). One of its three main engines will be tested this weekend for leaks around the area where a turbopump fuel duct was replaced. On Sept. 24 and 25, Kennedy Space Center managers will meet for a Flight Readiness Review to review Orbiter preparations and set a firm launch date. If Ulysses is not launched between October 5 and 23, the flight will have to be delayed until November 1991. [Brown, **FLORIDA TODAY**, pp. 1A-2A, Sept. 23, 1990.]

September 24: FLIGHT READINESS REVIEW BEGINS

Kennedy Space Center hosts a Flight Readiness Review for Discovery's STS-41 mission today and tomorrow; at its conclusion, NASA managers will announce a firm launch date for the mission. The target date has been October 5 but the space agency is out of contingency days to make that date. At Complex 39B, workers continued over the weekend to inspect engine cover seals for possible leaks; the checks have been ordered as a precaution, said KSC spokesman Karl Kristofferson. Today, technicians will install two batteries in one of Ulysses' two upper-stage boosters. [Brown, **FLORIDA TODAY**, p. 6A, Sept. 24, 1990, **KSC SPACE SHUTTLE PROCESSING STATUS REPORT**, Sept. 24, 1990.]

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TITAN 4 SCRUBBED AGAIN

The launch of a Titan 4 on a Department of Defense mission has again been scrubbed by the Air Force. On Sunday undisclosed problems led to a scrub and the inability to fix those problems led to a scrub early this morning. The first launch attempt had been September 20. The Air Force adhered to Department of Defense policy which is not to discuss the launch and its payload. ["Air Force Scrubs Titan 4 Launch for Third Time," **FLORIDA TODAY**, p. 6A, Sept. 24, 1990.]

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ULYSSES STATUS REPORT

Final launch preparations for the STS-41 payload are beginning this week. The Inertial Upper Stage computer memory load was performed today. This evening, the guidance system aboard the IUS, the Redundant Inertial Measurement Unit (RIMU) is being calibrated and aligned. The IUS Flight Readiness Checks are scheduled for overnight tonight. [They were successfully completed September 25.] Tuesday (September 25) morning the final battery installation for the IUS is scheduled. Then in the afternoon batteries will be installed aboard the PAM-S Assist Module. On

September 26, a simulated countdown will take the IUS/PAM-S combination through all launch day activities. The Ulysses Spacecraft completed a state-of-health check successfully on September 21, and another check is set for September 27. On September 28, upper stage ordnance will be installed. [Diller, ULYSSES STATUS REPORT, Sept. 24, 1990.]

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COLUMBIA TANKS DRAINED

Columbia's Power Reactant and Storage Distribution System tanks have been drained of their liquid hydrogen and liquid oxygen reactants and the mid-body umbilical is scheduled to be retracted this afternoon. Hydraulic circulation and sample tests are also scheduled for this afternoon. Main propulsion system checks will continue throughout the week. Defoaming of the fuel lines and leak checks in the Orbiter's aft compartment are continuing today. Dry ice will be used to assist in chilling down the liquid hydrogen lines to assist in the detection of leak sources. No tanking test is scheduled for Columbia at Launch Complex 39A. APU Number 1 will be removed from the Orbiter this afternoon and transported to the OPF for installation into the Orbiter Atlantis. Ordnance disconnect operations are scheduled for later this week. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Sept. 24, 1990.]

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ATLANTIS PROCESSING

Atlantis SCAPE operations over the weekend took longer than expected when thruster thermal barrier damage was noticed and repaired. The bay was opened for normal work this morning with continuing leak checks in the main propulsion system and freon servicing scheduled for today. The flash evaporator retest is scheduled for tomorrow. Rollover to the Vehicle Assembly Building will occur early in October. The external tank, attached to the solid rocket boosters on the mobile launcher platform in the VAB is undergoing final closeouts this week. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Sept. 24, 1990.]

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NOW CONSTRUCTION CONTRACT

NOW Construction, Inc. (Titusville, FL) was awarded a \$76,644 contract for the construction of maintenance and storage facilities at Kennedy Space Center. The company will have 135 days to complete a shed for storage of petroleum products, a mobile electrical generator maintenance area and a wash pad for the generators. The wash pad system will recycle the water used to clean the generators and store it for future use. All of the facilities will be located on Contractor Road, south of the Logistics Building

in the Launch Complex 39 area. [Kristofferson, KSC NEWS RELEASE NO. 157-90, Sept. 24, 1990.]

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MARSTEN/THG CONTRACT

Marsten/THG Leasing Co. (Tampa, FL) has been awarded a \$102,981 contract to provide a modular office building for the Life Sciences Program at Kennedy Space Center. Marsten will have 30 days to deliver the 2,700-square-foot housing unit for installation near Hangar L at Cape Canaveral Air Force Station. The structure will provide housing for experimenters from around the world who will have life sciences payloads flying aboard the Space Shuttle. Hangar L is the headquarters for KSC's Life Sciences Program which researches human physiology in space and advanced life support systems for long-range space missions. [Kristofferson, KSC NEWS RELEASE NO. 158-90, Sept. 24, 1990.]

September 25: DISCOVERY LAUNCH DATE SET

NASA managers today selected October 6 as the launch date for the joint ESA/NASA mission, STS-41, the mission to deploy the European Space Agency's Ulysses probe on a 5-year journey to study the Sun. "This date is a little success oriented and is dependent on not encountering any unusual problems," said Space Shuttle Director **Robert L. Crippen**. "But I think the Shuttle team has a good chance of making the 6th." He added that the schedule is tight and does not allow for unusual problems. Echoing Crippen's remarks, Kennedy Space Center's Deputy Director **Gene Thomas** said, "We don't have any room for mistakes."

The launch window for October 6 extends from 7:35 a.m. to 10:05 a.m. EDT. NASA received Office of Science Policy nuclear launch safety approval for the Ulysses mission on September 24, 1990. STS-41 will be the 36th Space Shuttle mission, and the 11th of the Discovery Orbiter. The mission is slated to last just over 4 days, with a planned landing at Edwards Air Force Base, CA. The flight crew for STS-41 is Commander **Richard N. Richards**, Pilot **Robert D. Cabana**, and Mission Specialists **William M. Shepherd**, **Bruce E. Melnick** and **Thomas D. Akers**. [Hess and Malone, STS-41 LAUNCH ADVISORY, Sept. 25, 1990, Banke, FLORIDA TODAY, p. 1A, Sept. 25, 1990, Glisch, THE ORLANDO SENTINEL, p. A-6, Sept. 26, 1990.]

September 26: BUDGET CUTS IMPACT

If the mandated budget cuts under the Gramm-Rudman-Hollings deficit control law take effect, NASA may lose about \$4 billion. That would force

the space agency to fly no more than four of ten planned flights between now and October 1991. "That would be a catastrophe for NASA," said **Dave Dickerson**, a spokesman for U. S. Representative **Bill Nelson** (D-Melbourne, FL).

The development work on the Space Station Program would be suspended and the Space Shuttle Program budget would be cut to \$3.4 billion or 32 percent less than the \$5 billion approved for 1990. In addition, work would be postponed on the Space Exploration Initiative, NASA's plan to return astronauts to the moon by 2010 and then to Mars by 2019; work would be delayed on the \$30 billion Earth Observation System, an array of satellites designed to monitor Earth's climate to learn more about environmental phenomena. The six EOS satellites are scheduled for launch in 1997 or 1998.

At Kennedy Space Center the 2,400 civil service workers would have to take three or four days off without pay every two weeks if no budget is passed by October 15. One-day furloughs will be in effect during the first two weeks of October if no budget is passed by October 1. The planned launch of *Discovery* - with its *Ulysses* Planetary Probe payload - will not be affected by the budget crisis, according to **William Lenoir**, Associate Administrator for Space Flight. However, a Department of Defense flight scheduled for November would be postponed until NASA could create a plan to operate with a reduced work force, Lenoir said. [Banke, **FLORIDA TODAY**, pp. 1A-2A, Sept. 27, 1990.]

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LEAK AREAS TARGETED ON COLUMBIA

Columbia may be leaking in any of 83 locations in its aft compartment, according to NASA engineers who have been investigating the leaks. Each of more than 200 joints in the Orbiter's main engine plumbing will be checked for leaks before Columbia is cleared for its next launch attempt. There will be a special launch-pad fueling test conducted in mid-October; it will call for filling part of the external tank to duplicate Columbia's leaks. Technicians will install a dozen video cameras in the engine compartment in an attempt to view the leaks. Another fueling test is scheduled now for November 12 or 13, just after the launch of *Atlantis*. Associate Administrator for Space Flight **William Lenoir** said of the planned tests, "I'm hopeful we will have gone through this entire sequence and have Columbia back in a flying sequence." He also said the earliest Columbia might be expected to fly is December. [Banke, **FLORIDA TODAY**, p. 8A, Sept. 27, 1990, "Nationline: Shuttle Leaks," **USA TODAY**, p. 3A, Sept. 27, 1990, **KSC SHUTTLE STATUS REPORT**, Sept. 26, 1990,

"Leak Tests Laid Out On Columbia," THE ORLANDO SENTINEL, p. A-11, Sept. 27, 1990.]

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DISCOVERY: LAUNCH PREPARATIONS

The two space suits carried aboard Discovery for contingency purposes are being installed in the airlock today. Later today, a test to simulate launch day events for the Inertial Upper Stage will begin at about 5 p.m. and it is expected to conclude with a simulated T-0 at about 7:30 tomorrow morning. Also tomorrow, a purge of the external tank is planned and the freon system will be topped off for launch.

On September 28, hypergolic propellant tanks on board the Orbiter will be pressurized and closed out; ordnance devices will be installed and firing circuits will be checked. Closeouts of the Shuttle's aft compartment are underway with completion scheduled for September 30. [KSC SHUTTLE STATUS REPORT, Sept. 26, 1990.]

September 27:

KSC FURLOUGH PLANS

Kennedy Space Center is ready to carry out a furlough plan should Congress and the Bush Administration fail to resolve this year's budget crisis before the 1991 fiscal year begins October 1. The plan includes the following: Twenty NASA employees at KSC will get Monday off without pay if no budget is passed; up to 100 KSC civil service workers will be furloughed for one day between October 2 and October 11 if the budget impasse continues; the remaining 2,300 NASA employees at the space center will get a day off without pay between October 12 and October 15. [Banke, FLORIDA TODAY, p. 4A, Sept. 28, 1990.]

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DISCOVERY: LAUNCH PREPARATIONS

At Launch Complex 39A, technicians topped off Discovery's cooling system with freon; the system has been slowly leaking since August. Engineers say the leak will not affect the Shuttle's ability to cool itself during Discovery's four-day mission which is scheduled to begin October 6. A purge of the external tank was completed today. The pad was closed for ordnance operations during which explosive devices were loaded and the firing circuits were checked. Tonight, the Orbiter's hypergolic propellant tanks will be pressurized and closed out. The Launch Pad Team is evaluating an increase in the hydraulic fluid system reservoirs located on the right solid rocket booster aft skirt. Closeouts on the Shuttle's aft compartment are underway. This work includes applying foam to various areas of the main propulsion system, final inspections of

various components, main engine closeouts, cleaning and removing platforms for flight. [KSC SHUTTLE STATUS REPORT, Sept. 28, 1990, Banke, FLORIDA TODAY, p. 4A, Sept. 28, 1990.]

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DISCOVERY MISHAP REVIEW REPORT

Failure to follow proper procedures and improper use of a C-clamp were the primary causes cited by an investigation board for damage to a reaction control system thruster at the Hypergolic Maintenance Facility's (HMF) east test cell. In addition, the board, chaired by Tom Cain, III, Chief, Operations Support Branch, Center Support Operations, found several contributing causes: the instructions technicians were following were not detailed enough and the technicians needed to be trained in the use of the thruster mounting fixture.

The incident occurred July 18, 1990, when one of the Orbiter's primary thrusters was being secured in a test fixture in the HMF checkout cell for inspections of a leak. The thruster was mounted in a fixture which was installed on an access platform and secured with one C-clamp. Subsequently, the fixture/thruster assembly rotated about the single C-clamp, striking a kick plate on a lower platform approximately 14 inches below where it was originally mounted. It continued falling an additional 17 inches to a service platform. The thruster sustained an impression about 4 1/2 inches long by 1/2 inch wide by 1/4 inch deep. Estimated repair cost was less than \$100,000 and no personnel were injured in the mishap. [Malone, NASA NEWS RELEASE NO. 161-90, Sept. 27, 1990, Banke, FLORIDA TODAY, p. 4A, Sept. 28, 1990.]

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COLUMBIA, ATLANTIS PROCESSING

Leak tests are continuing on the main propulsion system valves, actuators and areas of the recirculation pump package to try to isolate the source of Columbia's hydrogen leak. All joints have been leak checked and nothing has been detected so far. The KSC team is working with the team assigned to find the fuel leak. The team is planning to leak test a pre valve for main engine 2 using dry ice to cool it down this weekend. Details and requirements are being identified for a tanking test next month, but no date has been set for the test.

Atlantis underwent checks of its auxiliary power unit controller today. Seals of the 17-inch disconnect are scheduled to be installed today also. Closeouts are underway on all areas of the vehicle. Cleaning operations of the payload bay are to begin tonight. The payload bay doors will be closed tomorrow night. Rollover from the OPF to the Vehicle Assembly

Building is expected to come tomorrow night, as well. Closeouts of the external tank are continuing in the VAB in preparation for Orbiter mating operations scheduled for next week. [KSC SHUTTLE STATUS REPORT, Sept. 28, 1990.]

September 28: WEATHER ENDANGERS DELTA LAUNCH

Thunderstorms may halt today's launch of an Air Force Delta 2 which is scheduled for a 5:44 p.m. liftoff. Air Force meteorologists predict a 40 percent chance for launch. The launch window lasts until 6:12 p.m. The Delta's payload is the ninth of 21 Navstar Global Positioning System Satellites scheduled for launch by 1992. [Banke, FLORIDA TODAY, p. 4A, Sept. 28, 1990.]

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ACTIVISTS' LAWSUIT

An attorney for anti-nuclear activists said today that he will file a lawsuit at 10 a.m. this morning in federal court seeking to delay the launch of Discovery "to allow NASA time to: Resolve problems with Shuttle fuel leaks...; address the Office of Technology Assessment report that predicts a 50 percent chance of another Shuttle accident in the next 34 flights...; incorporate OTA safety recommendations into the Shuttle Program; explain revised safety statistics in the agency's final environmental impact reports for the mission.

"With all the uncertainty in the Shuttle Program right now, it seems NASA clearly has nothing to lose by waiting until November 1991 to make the launch," said Andrew Kimbrell, an attorney with the Foundation on Economic Trends, a Washington, D. C.-based group that is joining the Florida Coalition for Peace and Justice and the Christic Institute in filing the suit. [Brown, FLORIDA TODAY, p. 4A, Sept. 28, 1990.]

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TITAN MAKEOVER FOR VANDENBERG

Titan 4 Centaur rockets will launch from Vandenberg Air Force Base after the facilities are converted from Space Shuttle facilities. California's \$3.5 billion Space Shuttle Launch facilities were mothballed after the Challenger accident in 1986. Construction starts October 1 on converting Space Launch Complex-6 into a launch pad for Titan 4 rockets with Centaur Upper-Stage Boosters, according to a Pentagon spokesman. The conversion of SLC-6 will cost between \$300 and \$500 million, said a Vandenberg spokesman. ["Calif. Shuttle Pad Will Be Converted for Titans," FLORIDA TODAY, p. 5A, Sept. 29, 1990.]

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STORMS DELAY DELTA

Thunderstorms and thick clouds over Cape Canaveral today prompted a 24-hour delay in the launch of an Air Force Delta 2 rocket. Launch of the 13-story rocket and a \$65 million military navigation satellite has been rescheduled for 5:40 p.m. September 30. The launch window will extend until 6:08 p.m. ["Storms Ground Delta for 1 Day," **FLORIDA TODAY**, p. 6A, Sept. 29, 1990.]

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DISCOVERY BOOSTER LEAK

NASA engineers disclosed today that they suspect gaseous nitrogen might be leaking into a hydraulic system inside the base of Discovery's right solid rocket booster. The system will be inspected this weekend to determine whether any parts must be replaced; such replacement work is not expected to delay Discovery's launch which remains set for 7:35 a.m. October 6. Today workers finished topping off the Orbiter's cooling system with Freon. Technicians also installed ordnance devices used to separate the external tank and solid rocket boosters from the Shuttle during flight. Additionally, workers pressurized the propellant tanks that fuel the thrusters and rocket engines the Orbiter uses to steer in space. [Banke, **FLORIDA TODAY**, p. 6A, Sept. 29, 1990.]

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ACTIVISTS FILE LAWSUIT

"We have an extraordinary risk here from an agency whose competency in the last year has been abysmal," said **Andrew Kimbrell**, lawyer for the Foundation on Economic Trends which filed for a preliminary injunction to stop the October 6 launch of Discovery and its Ulysses payload. The Ulysses uses a radioisotope thermoelectric generator for power. Part of the Foundation's motion asks that the court force NASA to steer Galileo probe away from Earth when it passes on its way to Jupiter. NASA General Counsel **Edward Frankle** said, "It [the lawsuit] was not unexpected. It's basically similar to the one that was done last year with Galileo, and I hope it has the same result." The current complaint restates the risk of a Challenger-like explosion on launch and introduces the subject of fuel leaks. The government has until October 2 to respond; Ulysses will be launched October 6 at 7:35 a.m. [Glisch, **THE ORLANDO SENTINEL**, p. A-4, Sept. 29, 1990, "Ulysses Launch Imperils Environment, Suit Says," **FLORIDA TODAY**, p. 6A, Sept. 26, 1990.]

September 29: DISCOVERY COUNTDOWN BEGINS SOON

"We don't have any reason to think that we're going to experience a leak on Discovery," said Kennedy Space Center spokeswoman **Lisa Malone**. "We think we've got a good machine." Discovery's countdown begins October 3 at 3:30 a.m., leading to a launch October 6 between 7:35 a.m. and 10:05 a.m. Discovery's main 17-inch fuel pipeline has been repaired and no leaks have been found in tests of its rear engine compartment. Fueling of Discovery's external fuel tank begins October 5 at about 11:15 p.m. The point at which leaks occurred during fueling operations on both Atlantis and Columbia will occur at 11:45 p.m. when technicians begin pumping 8,400 gallons of fuel per minute into the ET. "I think the team is looking forward to it. It's been a while since we've launched. We're about due for one," Malone said. [Halvorson, **FLORIDA TODAY**, p. 5A, Sept. 30, 1990.]

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DELTA LAUNCH DELAYED, AGAIN

Bad weather forced the Air Force to postpone the launch of a Delta 2 rocket for a second time today. The mission has been rescheduled for October 1. Air Force Captain **Ken Warren** said the weather is expected to be more cooperative, with only a 50 percent chance of thunderstorms during the launch period. "We'll have the same potential problems, just less chance of them," he said. ["Delta Delayed Until Monday," **FLORIDA TODAY**, p. 5A, Sept. 30, 1990.]

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SPACEPORT USA ATTENDANCE

During this month, 206,530 guests visited Spaceport USA, 14.2% more than in September 1989. Year-to-date attendance stands at 2,518,632 visitors, 4.7% more than the 1989 number of 2,405,262 people. ["NASA Artwork on Display at Orlando International Airport," **Spaceport USA News Release NTO576**, Oct. 1, 1990.]

OCTOBER

October 1: DELTA 2 LAUNCH SUCCESSFUL

The Air Force's launch of a Delta 2 was flawless at 5:56 p.m. after two short delays in the final minutes before liftoff. The first delay was caused by an unauthorized aircraft straying too close to the launch pad and the second was a temporary problem with the tracking system in Bermuda. "The guidance system thinks it did a great job, and we can't find any reason to disagree," said Telemetry Manager Skip Mackey. The Global Positioning System Satellite will be used by military ground, sea or air units holding small, sophisticated receivers to pinpoint their location on Earth, an important aid for the American forces deployed in the desert of Saudi Arabia. "The maps don't have a lot of things our ground troops can go on," said Lt. Gen. Thomas Moorman, Jr. Commander of Air Force Space Command. [Banke, *FLORIDA TODAY*, p. 2A, Oct. 2, 1990, Glisch, *THE ORLANDO SENTINEL*, Oct. 2, 1990.]

□ DISCOVERY VALVE MALFUNCTION FOUND

During a test of the main engine propulsion system plumbing, engineers found a malfunction in a valve that helps control the flow of liquid oxygen into the second main engine of Discovery, according to Kennedy Space Center spokeswoman Lisa Malone. Workers entered Discovery's rear engine compartment early this morning to investigate why the valve failed. If the problem concerns the valve's electrical wiring, as officials suspect, the problem would be easier to fix than a mechanical failure. [See story below.] Engineers have until the morning of October 4 to solve the problem before considering delaying Discovery's launch, said Malone. She said that the problem is not related to the liquid hydrogen fuel leaks found on Atlantis and Columbia. [Banke, *FLORIDA TODAY*, p. 2A, Oct. 2, 1990.]

□ RTG LOADED ON DISCOVERY

The Ulysses Solar Probe's nuclear-powered generator (RTG) was installed today in preparation for the launch countdown to proceed tomorrow at 3:30 a.m. The generator, powered by 23.7 pounds of plutonium, was bolted onto the spacecraft, but not without some difficulty installing a small power control device on the generator. The head of one of four bolts that attaches the power control unit to the generator was accidentally sheared off during installation; the problem is not expected to affect the generator's operation or the launch. The payload bay doors were scheduled to be closed for flight at 8:17 a.m. October 3.

A monitoring team of 35 persons began setting up some \$13 million worth of equipment at the Cocoa Armory; the monitoring station will check radiation levels in Brevard County if a Shuttle accident causes a plutonium release. A federal court agreed to hear arguments October 4 on a lawsuit by anti-nuclear activists [see story above]. A problem with a liquid oxygen valve inside Discovery's rear engine compartment was fixed when technicians repaired a damaged electrical line. Workers were scheduled to move Atlantis into the Vehicle Assembly Building tomorrow to ready it for its November 7 Department of Defense mission. [Banke, **FLORIDA TODAY**, p. 1A, Oct. 3, 1990, Diller, **Ulysses Status Report**, Oct. 4, 1990, Glisch, **THE ORLANDO SENTINEL**, Oct. 2, 1990.]

October 3:

STS-41 CREW ARRIVES

Discovery's STS-41 Crew, aboard their T-38 jets, arrived at the Shuttle Landing Facility this afternoon at 3:30 p.m. Commander **Dick Richards** joked, "Florida's a beautiful place, but astronauts don't like to stay here very long. I think three days is about it for us." Discovery's launch is scheduled for between 7:35 a.m. and 10:05 a.m. October 6. Kennedy Space Center spokesman **Bruce Buckingham** said, "We have no indication that there are any problems waiting out there to grab us." Forecasters are predicting a 70 percent chance for favorable weather conditions at launch time; the only potential cloud on the horizon is a lawsuit in a Washington, D. C. federal court which seeks to halt the launch. The case will be heard October 4. Having plutonium aboard the Orbiter has prompted the U. S. government to set up 34 monitoring stations throughout the East Coast of Florida. Today a communications drill will be conducted by the Federal Radiological Monitoring and Assessment Center to test procedures needed if a Shuttle accident occurs. [Brown, **FLORIDA TODAY**, p. 1A, Oct. 4, 1990, Nagy, **FLORIDA TODAY**, p. 6A, Oct. 7, 1990.]

October 4:

ATLANTIS ACCIDENT IN VAB

The launch of Atlantis, currently scheduled for November, may be delayed due to an accident which occurred today in the Vehicle Assembly Building. A 9-foot-long yellow metal beam was left inside Atlantis' engine compartment by Lockheed Space Operations Co. workers, according to Kennedy Space Center Director **Forrest S. McCartney**. "It should have been caught and it wasn't," McCartney said. "I don't know how it happened." Technicians heard the beam crash through the engine compartment today as Atlantis was being hoisted into an upright position prior to being mated with its external tank and solid rocket boosters.

The Center Director said a quick check of the compartment revealed damage to foam insulation that covers some of the engine components in the three-level compartment. The accident may also have damaged fuel lines like those which have been leaking on Columbia since May. Leaks on Atlantis were found in a distinctly separate location and grounded its July launch. Lockheed has begun its own investigation of the incident.

The beam was part of a frame which enables work platforms to be placed in the Orbiter's rear compartment and allows access to main engine plumbing while the Shuttle is in a horizontal position in the Orbiter Processing Facility. Bolts which secured the beam had, apparently, been removed but the beam had not been taken from the compartment. Inspection documents erroneously indicated the beam had been removed. The paperwork, according to McCartney, had been Lockheed's responsibility to complete without NASA oversight.

Lockheed spokesman **J. B. Klump** said the company will be aggressive in determining how the accident happened. "We share NASA's concerns," Klump said, "and the investigative team will do everything it can to find out what the problem is and to take steps to make sure the problem doesn't happen again." Paperwork on Discovery's processing was also reviewed to ensure that no similar problem occurred in its rear engine compartment. Deputy Director of Shuttle Operations **Brewster Shaw** said he anticipated no problems with Discovery which is scheduled for launch in two days.

McCartney, referring to other processing problems with the Shuttle fleet, said, "I don't think we can say procedures were the problem. I don't think we can say training was a problem. I think what we can say is that we did not do the job in the way we intended to do it." Shuttle processing errors will be discussed when NASA's Aerospace Safety Advisory Panel visits KSC later this month. **Norman Parmet**, Chairman of the Advisory Panel, said the panel will investigate the effectiveness of first-line Shuttle processing supervisors and managers. "A lot of these guys," Parmet said, "just sit in an office and never see the hardware." [Banke, **FLORIDA TODAY**, pp. 1A-2A, Oct. 5, 1990.]

October 5:

ATLANTIS DAMAGE IS SLIGHT

Mission officials say that damage to Atlantis' rear engine compartment was minor and should delay the Defense Department launch only a day or so. "We're still continuing inspections, but thus far we have not found anything that I would consider significant damage," said Shuttle Launch

Director **Robert Sieck**. An investigation is underway to find out why a steel beam was left inside the compartment. Sieck said, "You can't see more than two feet in front of you in there [the engine compartment] before your line of sight is blocked by something. This beam was left in a very obscure area. Most of the damage can be repaired in place. In the worst case, you would have to remove small pieces of structure, lines or wires." Launch is still targeted for November 7. [Brown, **FLORIDA TODAY**, p. 1A, Oct. 6, 1990, Glisch, **THE ORLANDO SENTINEL**, Oct. 6, 1990.]

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JUDGE GASCH OK'S LAUNCH

U. S. District Court Judge Oliver Gasch, ruling as he did in the Galileo case, denied a request from anti-nuclear activists to halt the launch of Discovery and its plutonium-powered Ulysses Solar Probe. **William Lenoir**, Associate Administrator for Space Flight, said, "We're ready and anxious to go." Loading of propellants began at 11:25 p.m. today. Only minor leaks - meaning they were within acceptable limits - were noted. Kennedy Space Center spokeswoman **Lisa Malone** said, "People were wearing smiles in the Firing Room." The mood at KSC remains upbeat. Launch Director **Robert Sieck** said, "The mood of the team is confident - and that's despite distractions and disappointments recently. If the weather is good to us, we'll have some good news today." [Halvorson and Brown, **FLORIDA TODAY**, pp. 1A-2A, Oct. 6, 1990]

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STS-41 PAYLOADS

In addition to carrying the Ulysses Solar Probe aboard Discovery, STS-41 features a number of other experiments: There are a dozen rats aboard the Orbiter which will be injected with human proteins in an attempt to speed work on possible cures for osteoporosis and immunological disorders; a small flame in a sealed container will be ignited to study how fire spreads in zero gravity; a video camera which is operated by voice commands will be tested and another experiment involves plant growth in space. [Halvorson and Brown, **FLORIDA TODAY**, pp. 1A-2A, Oct. 6, 1990]

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BUDGET CUTS IMPACT ON NASA

If the United States Congress fails to pass a federal spending bill, there will be widespread layoffs within NASA's contractor work force, according to agency officials. The Shuttle launch schedule would be reduced from ten flights to four. **William Lenoir**, Associate Administrator for Space Flight, said, "We will have to down-size our contractor force significantly" if mandatory cuts take effect. The layoffs would commence within three to

four weeks of the budget cuts becoming reality. There was no local estimate of how many of Kennedy Space Center's 15,000 plus contractor employees would be effected by the cuts. Civil servants at the space center have already been notified of between on to 22-day furloughs, beginning as early as next week.

If the budget cut plan takes effect, NASA would find that its current \$12.3 billion budget would be reduced to \$8.5 billion. "We do have contingency plans for that," Lenoir said. "It gets very unpleasant fairly quickly. There's no question that our budgetary process makes it more difficult to run any long-term complex program because of the inability to plan ahead in a reliable way." [Brown, *FLORIDA TODAY*, p. 2A, Oct. 6, 1990.]

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ACTIVISTS ARRESTED

Dorothy Smith (Cocoa, FL), 81, and **Melinda Morton** (Americus, GA), 50, entered a restricted area at Kennedy Space Center's Gate 2B and were arrested for trespassing. **Bruce Gagnon**, leader of the Florida Coalition for Peace and Justice, said of the two women, "Their intention was to go and sit on the launch pad, but obviously we knew they weren't going to get very far." The two arrested were part of a 20-member group who protested the use of a plutonium-powered generator aboard the Ulysses Solar Probe. Morton and Smith had also been arrested on trespassing charges before launch of the nuclear-powered probe Galileo last year. They were held today at the Brevard County Detention Center in Sharpses on \$500 bond each. If convicted, each faces a sentence of one year in jail and a \$1,000 fine. [Halvorson, *FLORIDA TODAY*, p. 5A, Oct. 6, 1990.]

October 6:

DISCOVERY: A LAUNCH SUCCESS

The launch of Discovery this morning at 7:47 a.m. broke a string of setbacks for NASA. "It's good to be back in the air again," said Launch Director **Bob Sieck**. "The mood - I don't know if you'd say it's one of euphoria or relief." There was only one glitch which delayed Discovery's liftoff. An automatic ground control valve that regulates the flow of nitrogen between the Shuttle's fuselage and components malfunctioned, Sieck said. The countdown was halted briefly while officials switched to manual operation of the valve and resumed the countdown within minutes.

The weather contributed to a 12-minute delay in the launch when rain clouds threatened nearby. "What's important is that we launched a safe vehicle, a vehicle we believe will meet all of its performance objectives,"

Sieck said. The Ulysses Solar Probe was successfully deployed six hours after launch.

"We've been looking forward to this day for a long, long time," said **Peter Wenzel**, ESA Project Scientist for Ulysses. "We never gave up hopes. That's what it takes if you want to go to new frontiers and break new ground. You have to do a lot of hard work and have patience."

Sieck said he was optimistic that NASA's next mission - Atlantis' mission for the Department of Defense in early November - would proceed as planned. Officials have located and fixed Atlantis' hydrogen leak and do not expect major damage from a 70-pound steel beam accidentally left inside the Orbiter's engine compartment when the craft was hoisted upright for mating. NASA continues to look for the source of Columbia's leaks. "We're going to find and capture this diabolical leak in Columbia and get her back in the air this year," said Sieck. [Banker, SUN-SENTINEL, p. 3A, Oct. 7, 1990, Brown, FLORIDA TODAY, p. 1A-2A, Oct. 7, 1990, Glisch, THE ORLANDO SENTINEL, pp. A-1 & A-14, Oct. 7, 1990, KSC SHUTTLE STATUS REPORT, Oct. 9, 1990.]

October 8: **COLUMBIA: THE ROLLAROUND**

Today NASA added a new maneuver to its Space Shuttle Program when it completed its first "rollaround" of Columbia from Launch Complex 39A to Launch Complex 39B. Pad 39A had to be cleared for the November launch of Atlantis (STS-38). Atlantis had been scheduled for rollout this morning but remained inside the Vehicle Assembly Building due to adverse weather conditions. Repairs in Atlantis' main engine compartment will be completed at the pad.

About 25 areas were damaged when a beam was inadvertently left inside the compartment during flight preparations and it crashed through the compartment when Atlantis was hoisted for stacking last week. Final inspection reports and damage assessments are still pending, but Shuttle Launch Director **Robert Sieck** has reported that processing managers believe that remaining repairs can be completed at the pad. [Brown, FLORIDA TODAY, p. 6A, Oct. 9, 1990.]

October 9: **BOOSTERS RETRIEVED, WASHED**

The two solid rocket boosters retrieved after the launch of Discovery (STS-41) are being washed down at Hangar AF on the Cape Canaveral Air Force Station. Booster ordnance devices have been safed and foam will be removed October 10. The motor segments will be taken apart and sent to

Thiokol for refurbishment. The aft skirts and nose cones will be refurbished at the USBI facility here at Kennedy Space Center. [KSC SHUTTLE STATUS REPORT, Oct. 9, 1990.]

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COLUMBIA ON THE MOVE

Columbia is being transferred back to the Vehicle Assembly Building this morning because of adverse weather from Tropical Storm Klaus off the east coast of Florida. Blustery winds and rain showers are predicted in the Kennedy Space Center area for the next few days and winds are forecast to be gusting up to 40 knots. In the VAB, Columbia's main propulsion system will be worked on including the replacement of engine cover seals, a flex hose and associated leak and torque checks. Roll out to Launch Complex 39B is tentatively scheduled for no earlier than 12:01 October 12; a date for a planned tanking test is still being evaluated.

Baggies were installed on various joints and valves in the main propulsion system and the system was pressurized with gaseous helium October 6; no leaks were detected. Routine monitoring of the Astro-1 payload was reestablished through power supplied by ground support equipment. The Broad Band X-Ray Telescope was serviced with liquid argon on October 5 and will next be serviced on October 15. The payload is in good shape and no impact upon it is foreseen by the rollback to the VAB or the return to Launch Complex 39B later this week. Once the Orbiter returns to the launch pad, GSE will again take over power requirements for payload health checks.[KSC SHUTTLE STATUS REPORT, Oct. 9, 1990, STS-35/ASTRO-1 STATUS REPORT, Oct. 9, 1990, Leary, THE NEW YORK TIMES, p. B6, Oct. 9, 1990.]

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ATLANTIS PROCESSING ACTIVITY

Power-on stray voltage tests are underway today on Atlantis and a test of the boosters' actuators is planned. The Shuttle Interface Test is scheduled to be completed in the Vehicle Assembly Building. Due to adverse weather conditions, Atlantis will remain in the VAB a few extra days. Weather permitting, Atlantis (STS-38) is currently scheduled to be rolled out to Launch Pad 39A no earlier than October 11. Launch of STS-38 is scheduled for an early November liftoff on its Department of Defense mission. [KSC SHUTTLE STATUS REPORT, Oct. 9, 1990, Glisch, THE ORLANDO SENTINEL, Oct. 9, 1990.]

October 9: WORKERS OVERLOOKED BEAM: NASA

Simple oversight by three workers for Lockheed Space Operations Co. is the explanation NASA gave today as the reason why a 9-foot yellow beam was left behind in Atlantis' aft engine compartment. "It was so big, they just missed it [the beam]," said Conrad Nagel, Atlantis' Ground Processing Manager. "I know that sounds funny, but that seems to be what happened. It's like the guy who was stealing tractors from the warehouse: They're so big, the guard didn't question when they were being driven out." Nagel was unsure whether the incident would affect Lockheed's Shuttle Processing Contract at Kennedy Space Center. "They are embarrassed by this. We all are. It never should have happened. I hope it will never happen again," Nagel said. Lockheed, which has not yet submitted its final report to NASA, declined to comment. [Brown, FLORIDA TODAY, p. 7A, Oct. 10, 1990.]

October 10: DISCOVERY LANDS AT EDWARDS

Discovery touched down at 9:57 a.m. EDT today on the concrete runway at Edwards AFB, CA, ending a 4-day, 2-hour, 10-minute and 54-second mission. Over the next five days, KSC recovery team members will perform turnaround operations to ready the Orbiter for the ferry flight back to the space center. If operations go as planned, and weather permits, Discovery could be back at the Shuttle Landing Facility by Monday (October 15) evening. A one-day ferry flight is planned with a stopover at Kelly Air Force Base (San Antonio, TX). [KSC SHUTTLE STATUS REPORT, Oct. 10, 1990.]

□ COLUMBIA REACHES VAB

Columbia was transferred back to the Vehicle Assembly Building yesterday because of adverse weather from Tropical Storm Klaus off the East Coast of Florida. The Orbiter was in the VAB by about 8 p.m. and was hard down in the VAB around 9:30 p.m. Transfer operations took about two hours longer than expected because of minor mechanical problems with the crawler transporter. Blustery winds and rain showers are predicted in the KSC area for the next few days. Rollout to Launch Complex 39B is currently scheduled for no earlier than 4 a.m. Monday (October 15). [KSC SHUTTLE STATUS REPORT, Oct. 10, 1990.]

□ ATLANTIS: INTERFACE TEST COMPLETED

The Shuttle Interface Test on Atlantis has been completed. Today, workers will power down the vehicle and begin closing out all areas for the move

to the launch pad. Tomorrow (October 11), platforms will be retracted away from the vehicle and the crawler transporter will be positioned under the launch platform. Weather permitting, the STS-36 vehicle is currently scheduled to be rolled to the launch pad tomorrow evening at 8 p.m. While at the launch pad, a liquid hydrogen tanking test is planned to verify there are no leaks. Atlantis is scheduled to be launched in early November on a Department of Defense mission. [KSC SHUTTLE STATUS REPORT, Oct. 10, 1990.]

October 10: **DISCOVERY MAKES SAFE RETURN**

"Congratulations on a picture-perfect mission," astronaut **Brian Duffy** said from Johnson Space Center to Discovery's crew who landed at Edwards Air Force Base at 9:57 a.m. EDT. today. "Glad to have you back and also to have the fastest man-made object in the universe well on its way," Duffy added. Commander **Richard Richards**, Pilot **Robert Cabana** and Mission Specialists **Bruce Melnick**, **William Shepherd** and **Thomas Akers** climbed out of the Orbiter an hour after landing, greeted by loud cheers. Commander Richards said, "This losing streak is over and we're going on to do great things in the future."

The landing was on Edwards' concrete runway in order to test Discovery's new brakes which performed well. Shuttle Director **Robert Crippen** said the brakes and other systems all performed well, making STS-41 one of the best technically. A quick inspection revealed damage to only one heat-resistant tile. [Brown, **FLORIDA TODAY**, pp. 1A-2A, Oct. 11, 1990.]

October 11: **ATLANTIS READY FOR ROLLOUT**

Atlantis was powered down early this morning and closeouts of the Orbiter are continuing in preparation for rolling the Shuttle out to the launch pad. Platforms will be retracted away from the vehicle and the crawler transporter will be positioned under the launch platform later today. Weather permitting, the STS-38 vehicle is currently scheduled to be moved from the Vehicle Assembly Building to Launch Complex 39A beginning at 12:01 a.m. tomorrow. The rollout is expected to take six hours. While at the launch pad, a tanking test is planned to verify there are no leaks in the main propulsion system. Atlantis is scheduled for launch no earlier than November 7. [KSC SHUTTLE STATUS REPORT, Oct. 11, 1990, Banke, **FLORIDA TODAY**, p. 4A, Oct. 12, 1990.]

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MINOR GLITCH ON DISCOVERY FLIGHT

Apparently, the STS-41 mission was not entirely without incident. Officials are trying to determine why a software glitch went unnoticed until Discovery's crew checked out the spaceship's computer system on reaching orbit October 6. The system's program was telling the wrong computer to monitor certain systems. The problem was corrected and the crew was never in danger, officials said. "As it turns out, it really was a minor thing," according to Shuttle Project Engineer Chris Fairey.

Discovery's Ground Processing Manager John "Tip" Talone said Discovery was given a clean bill of health after inspections in California. "This is the best, and it just keeps getting better," said Talone. He said that so far inspections show the Orbiter's heat protection tiles, brakes and three main engines are in excellent condition. Only 10 to 15 tiles will have to be replaced. If operations go as planned, and weather permits, the Orbiter could be back at KSC's Shuttle Landing Facility by the evening of October 15 (Monday). A one-day ferry flight is planned with a stopover at Kelly Air Force Base (San Antonio, TX). [KSC SHUTTLE STATUS REPORT, Oct. 11, 1990, Banke, FLORIDA TODAY, p. 4A, Oct. 12, 1990.]

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COLUMBIA PROCESSING CONTINUES

Work on the main propulsion system of Columbia is continuing today including the replacement of engine cover seals, a flex hose and associated leak and torque checks. Additionally, workers will begin configuring the aft compartment for a tanking test at the launch pad. No date has been set yet for the tanking test. Rollout to Launch Complex 39B is scheduled for no earlier than 4 a.m. October 14 (Sunday) and the Broad Band X-Ray Telescope will be serviced with argon on the morning of October 15. [KSC SHUTTLE STATUS REPORT, Oct. 11, 1990, Banke, FLORIDA TODAY, p. 4A, Oct. 12, 1990.]

October 12:

COLUMBIA: CRUSHED SEAL FOUND

A second crushed seal in Columbia's engine compartment has been found, but NASA's leak hunters will not call off the search yet. "We kind of adopted a policy that said we will not say, 'Eureka!'" said Warren Wiley, Deputy Director of Shuttle Engineering at Kennedy Space Center. The damaged seal, part of a valve near a main engine, was actually found yesterday. A similar seal was found near another engine after Columbia's

September 5 launch attempt. Wiley said the damage to both seals was caused when they were incorrectly installed. "After three weeks of painstaking diagnostics and not really finding a lot, it was a much better day," Wiley said. Columbia is expected to return to the launch pad October 13 and be prepared for another leak test. If the oldest Orbiter passes the test, launch could take place in December. Atlantis moved to the pad starting at 8:25 p.m. today and was scheduled to arrive at 3 a.m. the next morning. Discovery is due to arrive at Kennedy Space Center on October 15. [Banke, **FLORIDA TODAY**, p. 1A, Oct. 13, 1990.]

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ATLANTIS ROLLS OUT

Atlantis was rolled out to pad 39A last night and was hard down on the pad at 3 a.m. today. Launch pad validation activities are continuing and a hot fire of auxiliary power unit number 3 was successfully completed. Preparations are underway for a helium signature leak test of the main propulsion system and three main engines. The test is scheduled to begin with a call-to-stations at midnight October 15 and continue through tomorrow. Preparations are also underway to load hypergolic propellants in the orbiter's onboard storage tanks later in the week. Next week a tanking test is planned in order to verify that there are no leaks in the main propulsion system. Launch remains scheduled for early November though no precise date has been set. [KSC SHUTTLE STATUS REPORT, Oct. 15, 1990.]

October 14:

COLUMBIA HARD DOWN AT 39B

Columbia was transferred from the Vehicle Assembly Building to Launch Complex 39B last night and was reported hard down at 7:55 this morning. Main propulsion system work is continuing today in the aft compartment; all 6 engine cover seals for the liquid hydrogen system and seals for the relief valves have been replaced. Leak tests are planned for tomorrow night. Officials are planning to conduct a tanking test later this month. The payload bay doors were opened about 10 p.m. for servicing of the Broad Band X-Ray Telescope with argon tomorrow morning. [KSC SHUTTLE STATUS REPORT, Oct. 15, 1990, "Pit Stop," **THE ORLANDO SENTINEL**, Oct. 15, 1990.]

October 15:

DISCOVERY COMES HOME TODAY

Discovery is expected to return to Brevard County skies today, but most won't get to see it because of its late arrival; it is expected at the Shuttle Landing Facility at 6:48 p.m., four minutes before sunset. The Orbiter will leave Edwards Air Force Base, CA, at 9:40 EDT aboard its carrier plane

and refuel in San Antonio, TX. The flight will continue to Kennedy Space Center if the weather remains good. Because NASA does not like to transport the Shuttle in the dark, pilots of the 747 carrier plane **A. J. Roy** and **Dave Mumme** will probably not fly along Brevard County's coast to the space center. "If there is any possible way the pilots can do that, they will. The Shuttle sure looks pretty flying up the beach at sunset," said **John "Tip" Talone**, Discovery's Manager in Charge for NASA. Demate operations will begin immediately after the SCA lands at the Shuttle Landing Facility. Discovery is expected to be ready for tow to Orbiter Processing Facility Bay 1 about 15 hours after landing. Booster disassembly operations are continuing at Hangar AF. Preparations are underway to ship the motor segments to Thiokol in Utah for refurbishment. [Banke, **FLORIDA TODAY**, p. 1A, Oct. 15, 1990, KSC SHUTTLE STATUS REPORT, Oct. 15, 1990.]

October 16: **DISCOVERY TO RETURN HOME, LATE**

Discovery, perched atop the Shuttle Carrier Aircraft, is expected to complete its trip home to Kennedy Space Center around noon today. Discovery and its workhorse 747 carrier left Edwards Air Force Base about 9:44 a.m. EDT yesterday and made a refueling stop at Sheppard Air Force Base (Wichita Falls, TX) before continuing to Eglin Air Force Base in the Florida Panhandle. The refueling operation took more time than expected because there was not enough jet fuel on hand for the 747 when cloudy weather caused it to land in Wichita Falls. When the refueling operation was completed there was only enough daylight remaining for the trip to Eglin AFB, according to **Bruce Buckingham**, KSC spokesman. Buckingham did say that the mated vehicles "may be doing a flyby if they have time." [Halvorson, **FLORIDA TODAY**, p. 1A, Oct. 16, 1990, KSC SHUTTLE STATUS REPORT, Oct. 16, 1990.]

□ **HOME AT LAST**

Discovery's jet carrier arrived at Kennedy Space Center's Shuttle Landing Facility today at 3:59 p.m., having circled over Patrick Air Force Base for twenty minutes waiting for the skies of KSC to clear. The Orbiter will be taken to a processing hangar today for thorough inspections and post-flight servicing. **Bruce Buckingham**, KSC spokesman, said, "It looks as good as it did when we rolled it out of the Orbiter Processing Facility."

Atlantis undergoes a launch pad test to determine whether a fuel leak that canceled a July flight has been repaired. The test date has been set for October 24. During the test, workers will partially fill Atlantis' external fuel tank and main propulsion system with liquid hydrogen and liquid

oxygen. The Orbiter's next mission will come no earlier than November 9. Damage done to the Shuttle by a falling beam mistakenly left inside the aft compartment is not expected to delay the launch. Repairs are underway coincident with routine work at Launch Complex 39A. The Flight Readiness Review - a two-day meeting at Kennedy Space Center - for STS-38 begins October 30, after which a firm launch date will be announced.

Columbia will also undergo a launch pad leak test now scheduled for the week of October 29. No launch date will be announced for its mission until all leaks have been found and repaired. [Brown, **FLORIDA TODAY**, p. 1A, Oct. 17, 1990, **KSC SHUTTLE STATUS REPORT**, Oct. 17, 1990, "Discovery Hits the Home Stretch," **THE ORLANDO SENTINEL**, p. A-1, Oct. 17, 1990.]

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LAUNCH TOWER RESOLUTION OK'D

The U. S. House of Representatives voted this week to support the re-erection of a Saturn V launch tower as a national monument. The support came in language added to the appropriations bill by Rep. Bill Nelson (D-Melbourne, FL) and directs the National Park Service to study possible sites and costs for the re-assembly of the tower. Interest in the tower has been expressed by Titusville, FL, officials who would erect it - along with a Saturn V replica - at Sand Point Park. The Launch Umbilical Tower, which measures 400 feet when erect, is now in sections in a fenced-in area in the Kennedy Space Center Industrial Area. The tower was last used in 1975's Apollo Soyuz Test Project and was dismantled in 1981 after the start of the Shuttle flights. Nelson said, "Making the tower a national monument could enhance local efforts to raise the private funds needed to re-erect the tower and save it from decaying at Kennedy Space Center." No money has been appropriated for the project which would cost an estimated \$15 million. [Banke, **FLORIDA TODAY**, p. 5A, Oct. 17, 1990.]

October 17:

ATLANTIS: LEAK TEST COMPLETED

The helium signature leak test of Atlantis' main propulsion system and three main engines was successfully yesterday and preparations are continuing to load hypergolic propellants into the Orbiter's onboard storage tanks on October 18 and 19. Monomethylhydrazine and nitrogen tetroxide will be loaded into the Orbiter's reaction system and orbital maneuvering system storage tanks. A tanking test is planned for October 24. Managers have also decided to test the Orbiter's oxygen system to see whether any fuel line damage occurred when a beam fell in the rear engine compartment earlier in the month. The work is not expected to delay the

launch of Atlantis. Launch Complex 39A will be closed October 18 and 19 while hazardous propellants are loaded into the Orbiter's onboard storage tanks. [KSC SHUTTLE STATUS REPORT, Oct. 17, 1990, Brown, FLORIDA TODAY, p. 7A, Oct. 18, 1990.]

□ COLUMBIA: LEAK TROUBLESHOOTING CONTINUES

Leak tests of the main propulsion system are planned today as the tiger team continues troubleshooting efforts. A target date for the liquid hydrogen tanking test is planned for October 29. A helium signature leak test - identical to the one completed yesterday on Atlantis - is planned for October 18. After the helium leak test, technicians will begin to apply foam to various areas of the main propulsion system in preparation for the tanking test. [KSC SHUTTLE STATUS REPORT, Oct. 17, 1990.]

□ DISCOVERY IN OPF

During the demating process workers were unable to loosen one of the three bolts which attached Discovery to the Shuttle Carrier Aircraft so managers decided to leave the bolt in place and separate the bolt on the aircraft's attach point instead. In the Orbiter Processing Facility the stuck bolt will be removed during routine post-flight processing, officials said. [Brown, FLORIDA TODAY, p. 7A, Oct. 18, 1990.]

October 19: HUMAN ERROR CAUSED ATLANTIS MISHAP

Lockheed Space Operations Co. said today that human error was to blame for the October 3 incident in which a nine-foot yellow beam was mistakenly left inside Atlantis' rear engine compartment. That error was compounded when other workers signed paperwork which said that the beam had been removed, the report said. "Am I happy with that? You bet your life I'm not. Any mishap or incident is just not good news, and you have to be very concerned," said Center Director **Forrest S. McCartney**. "That's an incident that shouldn't have happened." Regarding the report itself, he said, "We have reviewed the report and believe the report accurately reflects the situation."

The beam is part of a kit which allows technicians to work inside the rear engine compartment while the Orbiter is in a horizontal position. The kit components normally are removed and inventoried before an Orbiter is towed to the Vehicle Assembly Building. The beam crashed through the rear engine compartment when Atlantis was hoisted into an upright position in the VAB. Both a technician and a quality control inspector from Lockheed signed documents that said the beam was removed. Cost

of the accident was not revealed in the report, but workers are scheduled October 23 to replace part of a liquid oxygen fuel line that was badly dented by the beam, according to officials. Director McCartney said that NASA was satisfied with Lockheed's investigation and that NASA will likely adopt recommendations in the report which range from installing new, more automated inventory control systems to re-writing procedures to clarify them. [Banke, FLORIDA TODAY, p. 6A, Oct. 20, 1990.]

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ATLANTIS: STS-38 STATUS

Hypergolic propellant loading operations are continuing today and are scheduled to be completed this evening. Monomethylhydrazine is being loaded today. Yesterday, workers completed loading nitrogen tetroxide into the orbiter's reaction control system and orbital maneuvering system storage tanks. [KSC SHUTTLE STATUS REPORT, Oct. 19, 1990.]

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DISCOVERY: STS-39 STATUS

Preparations are underway for opening the payload bay doors. The payload bay will be deconfigured from the STS-41 mission. The tail cone and ferry flight kit items will be removed over the next few days. In Hangar AF, booster disassembly operations are continuing and preparations are underway to ship the motor segments to Thiokol in Utah for refurbishment. [KSC SHUTTLE STATUS REPORT, Oct. 19, 1990.]

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COLUMBIA: STS-35 STATUS

A helium signature leak test began last night and will be completed later tonight. This test is part of activities identified by the leak investigation team and it will check for leaks in the main propulsion system and main engines. After the test, technicians will begin applying foam to various areas of the main propulsion system in preparation for the tanking test on October 29. [KSC SHUTTLE STATUS REPORT, Oct. 19, 1990.]

October 20:

BEAM MISHAP HURTS LOCKHEED

Leaving a 9-foot, 47-pound beam inside Atlantis' engine compartment and, thereby, damaging several components in the compartment, will reflect poorly on Lockheed's report card NASA managers think. "Everybody is held accountable for their actions. We hold Lockheed accountable for that action, just as for the good things," said Kennedy Space Center Director Forrest S. McCartney. A Lockheed investigation report said human error was to blame for the accident. The Center Director called the mishap "an infrequent occurrence. It will reflect negatively on their performance, just

as there are many things that reflect positively. I think Lockheed is doing a fine job. By no means does that say there is not room for improvement, but I know of very few operations where improvements can be made."

Nearly all the damage to Atlantis' plumbing has been repaired and NASA hopes to launch the Orbiter by November 10. The Shuttle undergoes final leak checks October 24 and, if the results are positive, a definite launch date will be announced afterward. [Banke, **FLORIDA TODAY**, p. 6A, Oct. 21, 1990, National Public Radio, October 23, 1990.]

October 23: **ATLANTIS TEST SCHEDULED**

Final preparations for an October 24 leak test on Atlantis began at 7 a.m. today, according to Kennedy Space Center spokeswoman **Lisa Malone**. If Atlantis passes the test, the Orbiter should be ready for launch on or about November 10, according to KSC Director **Forrest S. McCartney**. The Oct. 24 test will send supercold liquid hydrogen and liquid oxygen into Atlantis' external tank. Sensors will aid engineers in detecting leaks. In previous tests, only liquid hydrogen had been used because only the fuel side of the system was found to be leaking; this time, officials want to load liquid oxygen as well to ensure that there is no undetected damage from the October 3 accident in which a nine-foot beam was mistakenly left inside the Orbiter's rear engine compartment. [Banke, **FLORIDA TODAY**, p. 3A, Oct. 22, 1990, Glisch, **THE ORLANDO SENTINEL**, Oct. 23, 1990.]

□ **COLUMBIA: STS-35 STATUS**

Foaming operations are continuing on the main propulsion system in preparation for the tanking test on October 29. Baggies and instrumentation will be installed later this week. Fit checks of the two special aft compartment doors made of a plexiglass type material is scheduled for today. These doors were made transparent to allow visibility into the aft compartment during tanking operations. A health maintenance test of the Astro payload began yesterday and is scheduled to be completed by this afternoon. Drying of the forward reaction control system thrusters and functional testing of the waste containment system are underway. [KSC SHUTTLE STATUS REPORT, Oct. 23, 1990.]

October 24: **ATLANTIS PASSES LEAK TEST**

"We feel that we have a tight ship and that we performed a successful test," said NASA spokesman **Bruce Buckingham** after Atlantis passed a critical tanking test today. "It appears we have licked the leak problem,"

Buckingham added; Center Director Forrest S. McCartney said, "I think we're ready to fly." Launch will occur either November 9 or 10; the date will be set following a flight readiness review which begins October 29. Atlantis failed three previous tanking tests in June and July. Columbia will undergo a similar leak test either October 30 or 31 and if it also passes its test, launch of the oldest Orbiter could come in early December. [Halvorson, **FLORIDA TODAY**, p. 1A, Oct. 25, 1990, Malone, **KSC NEWS RELEASE NO. 174-90**, Oct. 23, 1990, **KSC SHUTTLE STATUS REPORT**, Oct. 24, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 and A-16, Oct. 25, 1990, "Atlantis Passes Leak Test at Last," **SPACE NEWS**, p. 2, Oct. 29-Nov. 4, 1990, "Tanking Test Shows Atlantis Free of Leaks," **SPACE NEWS ROUNDUP**, p. 1, Oct. 26, 1990.]



SAUER INC. WINS KSC CONTRACT

Sauer, Inc. (East Jacksonville, FL) has been awarded a \$125,800 contract to install gaseous helium and gaseous nitrogen pipelines at Kennedy Space Center. When completed, approximately 1,200 feet of new pipeline for each gas will run from existing connections on the fifth floor of the Vehicle Assembly Building to ground level and then to the Orbiter Processing Facility's High Bay 3. Gaseous nitrogen is used to clean and purge various Orbiter systems; helium is pumped into fuel lines and other Shuttle systems to check for leaks before liquids are loaded prior to launch. [Kristofferson, **KSC NEWS RELEASE NO. 159-90**, Oct. 24, 1990.]



TIDEWATER ELECTRO-MAGNETICS CONTRACT

Tidewater ElectroMagnetics, Inc. (Virginia Beach, VA) has been awarded a \$319,990 contract to provide speaker monitors for a fiber-optic communications network at Kennedy Space Center. Tidewater will provide 290 monitors to KSC; the units will be incorporated into the Center's Operational Intercommunication System-Digital (OIS-D). The speakers will allow technicians to hear such information as Space Shuttle pre-and post-launch situation reports without having to be plugged into panels while wearing headsets. With the speakers, these workers will be freer to move about, and others nearby will also be able to hear the transmissions. The OIS-D system provides a fiber-optic cable network for telecommunications between Space Shuttle operations, payload and launch facilities. [Kristofferson, **KSC RELEASE NO. 169-90**, Oct. 24, 1990.]



EXCELLENCE AWARD WINNERS

The Rockwell International, Space Systems Division (Downey, CA) and Marotta Scientific Controls, Inc. (Montville, NJ) have been named recipients

of the 1990 George M. Low Trophy. The Excellence Award, renamed the George M. Low Trophy by NASA Administrator Richard H. Truly, recognizes NASA prime contractors, subcontractors and suppliers for outstanding achievement in quality and productivity improvement and total quality management. NASA Deputy Administrator J. R. Thompson, Jr. announced the selections tonight at the Seventh Annual NASA/Contractors Conference (Grenelle, FL). "These two firms have demonstrated exceptional performance in attaining a level of quality and productivity that commands our respect and deep appreciation," Thompson said.

Rockwell's Space Systems Division provides products and services ranging from production of the fifth Space Shuttle Orbiter - Endeavour - to existing Orbiter refurbishment and a variety of specialized studies in support of space operations. Marotta provides critical valves and systems for NASA flight vehicles, launch pads and engine test facilities. Marotta is the first recipient of the award in the newly established small business category. The seven other finalists for the 1990 award were:

- *Barrios Technology, Inc. (Houston, TX)
- *Bendix Field Engineering Corp. (Seabrook, MD)
- *Boeing Computer Support Services (Huntsville, AL)
- *EG&G Florida, Inc. (Titusville, FL)
- *Grumman Technical Services Division (Titusville, FL)
- *Honeywell, Inc. (Clearwater, FL)
- *Unisys Corp., Space Systems Division (Houston, TX)

"Since NASA established the award in 1984, hundreds of NASA's contractor partners have participated in the rigorous and valuable evaluation process...a process which measures sustained and demonstrated achievement in a broad range of criteria," said George A. Rodney, NASA Associate Administrator for Safety and Mission Quality. [Brown, NASA NEWS RELEASE NO. 90-145, Oct. 25, 1990, "Rockwell Wins Low Trophy," SPACE NEWS ROUNDUP, p. 1, Oct. 26, 1990.]

October 25:

ATLANTIS STATUS REPORT

Following yesterday's successful tanking test which verified the integrity of Atlantis' main propulsion system (MPS), work began to prepare the Orbiter for its STS 38 mission in November. Final readings of the hydrogen leak detectors showed minimal leakage in the area of the 17-inch disconnect and in the aft compartment, all well within allowable limits. Also, the liquid oxygen MPS lines were proved free of problems. Today on Launch Complex 39A, liquid hydrogen boil off operations were completed

about 10:00 a.m. Following purge operations of the external tank, the pad will be reopened for normal work. Access will be gained in the aft compartment and work will continue to ready Atlantis for flight. Also, following the purges, potable water samples will be taken. On October 28, a main engine flight readiness test is scheduled. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Oct. 25, 1990.]

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COLUMBIA STATUS REPORT

Foaming operations in the aft compartment continue today as workers prepare Columbia for the special tanking test early next week. Schedules indicate the test of the liquid hydrogen lines on the Orbiter will occur Tuesday October 30. There is a slight possibility the test may slip to October 31, depending on work to be performed this weekend. Tanking preparations are currently underway and flow meters are being set up for the test. Fit checks will continue today on the two special transparent aft compartment doors which allow visibility into the compartment during tanking. The work crew will install special lighting in the aft compartment tomorrow for the cameras that have been installed to support the test. External tank purges are scheduled to begin tomorrow and the payload bay doors will be cycled closed. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Oct. 25, 1990.]

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DISCOVERY STATUS REPORT

The lube oil deservicing of Discovery's auxiliary power units was completed last night and hypergolic deservice operations will take place this weekend. The forward reaction control system is scheduled to be removed tomorrow, October 26. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Oct. 25, 1990.]

October 26:

STS-35 STATUS REPORT: COLUMBIA

Foaming operations in the aft compartment have been completed as workers make last minute preparations to ready the Orbiter for the special tanking test early next week. The schedule indicates the test of the hydrogen lines on Columbia will occur October 30, with a slight possibility of a one-day slip, depending on work remaining to be performed. Today crews will install special cameras in the aft compartment in preparation for the tanking test. The aft compartment is now covered with plexiglass-like doors made of Lexan to allow observation during the test. Payload servicing has been completed and the payload bay doors will be closed late this afternoon. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Oct. 26, 1990.]

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STS-38 STATUS REPORT: ATLANTIS

Operations were halted briefly at the pad this morning as SCAPE operations were instituted to repair minor leaks at the hypergolic oxidizer and fuel farms. Hazardous materials specialists were called to Launch Complex 39A about 8:30a.m. when sensors detected traces of hypergolic fuels seeping from a few valves. Because the fuels evaporated immediately, the exact amount of the leak is unknown, said Kennedy Space Center spokesman **Bruce Buckingham**. "We fixed the leak and no further action is required," he said. The pad was re-opened for operations at 10:30 a.m. The leaks were thought to have been caused by cooler weather experienced overnight and no delay in the launch schedule is expected.

Purge operations of the external tank have been completed following October 24's successful tanking test. Access was gained to the aft compartment and work continues to ready Atlantis for flight. Fuel cell voltage adjustments will also be made at the pad today. The Flight Readiness Review has been scheduled for October 29 and 30, after which a firm launch date is expected to be announced. At Cape Canaveral Air Force Station another hazardous fuels incident occurred about 12:45 p.m. Technicians were working in a small laboratory near Hangar S with a small amount of nitrogen tetroxide when a power outage occurred, causing ventilation fans to stop. Some fifty to sixty persons were evacuated as a precautionary measure and the area was reopened a half hour later. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Oct. 26, 1990, Brown, FLORIDA TODAY, p. 6A, Oct. 27, 1990.]

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STS-39 STATUS: DISCOVERY

Power-on testing is scheduled to begin today on Discovery, followed by hypergolic offload preparations. Hypergols are scheduled to be removed from the Orbiter's OMS/RCS systems this weekend. The Forward Reaction Control System has been rescheduled to be moved to the Hypergolic Maintenance Facility early next week. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Oct. 26, 1990.]

October 27:

BREVARD FIRMS WIN GRANTS

Four Brevard County businesses have been awarded NASA Small Business Innovation Research grants, space agency officials said. The SBIR Program was established by Congress in 1982 to encourage technological innovation. Researchers who are recipients of the grants are awarded up to \$50,000 to develop proposals for further federal funding that could be as high as

\$500,000. The Brevard firms awarded grants were Hypertech Systems (Melbourne, FL), Integrated Software (Palm Bay, FL), Merritt Systems (Merritt Island, FL) and Mainstream Engineering (Rockledge, FL). ["Four Brevard Firms Win Grants," **FLORIDA TODAY**, p. 10E, Oct. 28, 1990,]

□ AWARD OF RECOGNITION: NOVAK

Howard Novak (Satellite Beach, FL), a scientist with USBI Co. at Kennedy Space Center, has received an Award of Recognition for developing a new way to check paint for adhesion purposes. Novak's work - a paper titled "Abrasive Media Coating Scribing for Wet/Dry Tape Testing" - will be published in the NASA Tech Briefs technical journal. ["USBI Scientist Wins Recognition Award," **FLORIDA TODAY**, p. 9E, Oct. 28, 1990.]

□ SILVER SNOOPY AWARDS

Astronauts **Mike McCulley** and **Curt Brown** have presented the Astronaut's Silver Snoopy Award for contributions to the U. S. manned space program to five EG&G Florida Inc. employees: **Thomas Cox, Jr., Patricia Sims, Madeleine Fortney, Roberta Sirmons** and **Alan Watson**. ["EG&G Employees Earn Silver Snoopy Awards," **FLORIDA TODAY**, p. 9E, Oct. 28, 1990.]

□ RECYCLING PROGRAM AT KSC

Kennedy Space Center will expand its existing programs of reusing oil and precious metals by recycling more ordinary office waste, i.e., white paper and aluminum cans. "There's always been quite an interest there, because the people over at Kennedy are concerned about the environment," said KSC Deputy Director **Gene Thomas** who is also in charge of the space center's recycling efforts. The center will recycle waste lumber and wood by next month and will begin recycling waste paper and aluminum cans by the end of the year. KSC already recycles waste oil for use in its boilers, salvages precious metals such as gold and silver from equipment, recycles aluminum and makes use of reusable paints. [Oates, **THE ORLANDO SENTINEL**, Oct. 28, 1990.]

October 29: FLIGHT READINESS REVIEW: STS-38

A Flight Readiness Review for STS-38 (Atlantis, OV-104) is being held today at Kennedy Space Center. NASA and contractor representatives will discuss the readiness to launch the Orbiter Atlantis. At the conclusion of the review tomorrow, an official launch date and window will be announced. On Wednesday (October 31), a Flight Readiness Test of the

Shuttle's three main engines will be conducted at Launch Complex 39A. The test includes a total check of the engines' electrical system and cycling of the engine valves. Later in the week, ordnance devices will be installed on the vehicle and tests of the firing circuits will be conducted. STS-38 is a classified Department of Defense flight. [KSC SHUTTLE STATUS REPORT, Oct. 29, 1990, Halvorson, FLORIDA TODAY, p. 1A, Oct. 28, 1990.]



CALL TO STATIONS FOR COLUMBIA

A call-to-stations for the liquid tanking test for Columbia occurred on schedule today at approximately 7 a.m. Today workers prepare Columbia's aft compartment for tomorrow's test. Chilldown of the main propulsion system lines is set to begin at 7 a.m. tomorrow (October 30). The test is a diagnostic one designed to identify and pinpoint any leaks. Main propulsion system feed lines, main engines and all associated components in the liquid hydrogen system will be investigated during the test while the tank is being loaded with propellant. After the test, the tank will be purged and the residual liquid hydrogen will be allowed to boil off. Launch Complex 39B will be reopened for launch preparations October 31.

Ten cameras have been installed in Columbia's aft compartment and main propulsion system joints have been bagged and instrumentation installed. Fuel leaks have been found and repaired in both a 17-inch pipeline between the Shuttle's external tank and the Orbiter and Columbia's rear engine compartment. If Columbia passes its test October 30, the Shuttle and its ten day astronomy mission could be launched in early December. [KSC SHUTTLE STATUS REPORT, Oct. 29, 1990, Halvorson, FLORIDA TODAY, p. 1A, Oct. 28, 1990, Halvorson, FLORIDA TODAY, p. 4A, Oct. 30, 1990, "Columbia Gets Fuel Test Today," THE ORLANDO SENTINEL, Oct. 30, 1990.]



DISCOVERY: HYPERGOL BURNOFF

Residual hypergolic propellants are being drained from the orbiter today in Orbiter Processing Facility Bay 1. Offload of the oxidizer is complete and the fuel is being drained. The OPF is closed to all non-essential personnel during the draining operation. The forward reaction control system is scheduled to be removed October 31 and transferred to the Hypergolic Maintenance Facility for routine post-flight inspections. [KSC SHUTTLE STATUS REPORT, Oct. 29, 1990.]

October 30:

200TH DELTA LAUNCH TODAY

McDonnell Douglas Space Systems Co. will attempt to launch its 200th Delta rocket today during a launch window which extends from 6:16 to 7:22 p.m. "We're getting ready to put a little ball of fire into the sky," was the way McDonnell Douglas employee **Ray Adams** expressed it. Air Force meteorologists say there is an 80 percent chance that the weather will be favorable for a launch. The Delta will lift an Inmarsat 2-F1 spacecraft into orbit. The craft is owned by a 61-nation consortium known as the International Maritime Satellite Organization which operates a system of satellites that provide a growing menu of mobile satellite services for maritime, aeronautical and land-based users. The 3,054-pound spacecraft, which will be deployed some 44 minutes after the Delta's lift off, was built by British Aerospace Space Systems.

The International Maritime Satellite Organization (London, UK) has invested \$610 million to build and launch four Inmarsat 2 spacecraft, and to construct ground stations that will relay transmissions over the satellite constellation, according to Gavin Trevitt, an Inmarsat spokesman. The company was founded in 1982 to offer international satellite capacity for mobile transmissions to ships at sea. [Halvorson, **FLORIDA TODAY**, p. 4A, Oct. 30, 1990, Marcus and Saunders, **SPACE NEWS**, p. 4, Oct. 29 -Nov. 4, 1990.]

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STS-38 LAUNCH SET

NASA and Department of Defense Managers today established November 9 as the target date for the launch of STS-38 Space Shuttle Atlantis. The 4-hour launch period for this classified DOD flight begins at 6:30 p.m. EST. The decision to launch Atlantis on the 9th was made following the STS-38 Flight Readiness Review at Kennedy Space Center. The five-man crew for the mission includes Commander **Richard O. Covey**, Pilot **Frank L. Culbertson** and Mission Specialists **Carl J. Meade**, **Robert C. Springer** and **Charles D. "Sam" Gernar**. Covey has twice flown aboard Shuttles and Springer once before. [Cast and Young, **KSC NEWS RELEASE NO. 90-86**, Oct. 30, 1990.]

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PROTESTOR FOUND GUILTY

Dorothy Scott Smith (Cocoa, FL) was found guilty today of trespassing during a protest at Kennedy Space Center; she will not serve additional jail time. She pleaded no contest to two counts of trespassing after a warning and two related charges. Judge Peter Haddad credited Smith with the 25 days of jail time already served before the proceeding and suspended the

remainder of her one year sentence. On October 5, Smith was involved in a rally to protest the launch of Discovery which carried the Ulysses spacecraft which was powered by plutonium. Ms. Smith said that she would again trespass given the same circumstances. She added, "I believe everyone has a responsibility to abolish all forms of nuclear weapons." [Rowe, **FLORIDA TODAY**, p. 2B, Oct. 31, 1990.]

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SHUTTLE FLEET FREE OF LEAKS

Columbia passed its crucial tanking test today and that success will enable NASA to set a firm launch schedule for 1991. "We're elated," said veteran astronaut **Vance Brand**, Commander of the Orbiter's seven-man crew for STS-35. "We look forward to flying as soon as we can." Brand's launch may come in early December. Referring to the morale boost which Columbia's test success gives to KSC employees, Launch Director **Robert B. Sieck** said, "There was a sense of victory in that these tests are behind us." Shuttle Program Director **Robert Crippen** added, "We ended up with a tight ship and as far as we're concerned, Columbia is ready to fly after we go through our final launch preparations." Today's test involved pumping 385,000 gallons of liquid hydrogen into Columbia's main propulsion system in an effort to isolate any fuel leaks. Only minor leakage - about 20 percent of the allowable limit - was recorded during the test. [Halvorson, **FLORIDA TODAY**, pp. 1A-2A, Oct. 31, 1990.]

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YOUNG HEADS PROCEDURES INVESTIGATION

Veteran astronaut **John Young** is at work for NASA again, but this time he's heading an investigation of safety procedures and a series of Shuttle launch processing accidents at Kennedy Space Center. Young is special assistant for engineering operations and safety to the center director at Johnson Space Center. NASA's Aerospace Safety Advisory Panel is also at KSC for two days of detailed interviews with space center employees. "We're going to spend time talking to the individual technicians, the hands-on folks," said the panel's Executive Director **Gil Roth**.

Space Shuttle Program Director **Robert Crippen**, speaking of Young's investigative team, said, "Sometimes having an outside set of eyeballs will enable you to see some things that aren't obvious." Johnson Space Center's **Dan Germany** said, "There's a tendency for some people to think that this is like some big witch hunt. It's not. They'll be seeing what loose ends need to be tied up." Germany is Manager of the Orbiter Projects Office at JSC. NASA's Deputy Administrator **J. R. Thompson** said, "When I look at the quantity of the work down here [KSC] and compare it to the quality of the work, it's an outstanding job."

Young will report next week to **William Lenoir**, the NASA Associate Administrator for Space Flight and the man who appointed the panel. The investigative findings will be passed along to KSC Director **Forrest S. McCartney** and to Shuttle Program Managers. Members of the panel include: **Jim Ehl** (Deputy Associate Administrator for NASA's Safety Office), **Charles Mertz** (Chief of the Safety System Branch), **Wiley Bunn** (Head of the Quality Assurance Office at MSFC), and **John Starnes** (Johnson Space Center). Information gathered by ASAP will be part of its annual review of Shuttle operations. The recommendations by NASA's Flight Safety Advisory Panel will be made in a report to be released in March 1991. [Brown and Halvorson, **FLORIDA TODAY**, pp. 1A-2A, Oct. 31, 1990, Isbell, **SPACE NEWS**, pp. 1 & 19, Oct. 29 - Nov. 4, 1990.]

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200TH DELTA LAUNCHED

"This is the kind of flight we like - watching that bird go up and doing what it is supposed to do," said McDonnell Douglas launch commentator **Ray Adams** of the 200th successful launch of a Delta vehicle which carried a \$90 million spacecraft (Inmarsat) belonging to the International Maritime Satellite Organization. Launch came at 6:16 p.m. Mission Director **Don Tutwiler** said the flight marked a milestone for McDonnell Douglas, which has been launching Delta rockets since 1960. "There aren't many launchers in the world who can claim 200. Honestly, it's a thrill for me and the entire Delta launch team," he said. **Ahmad Ghais**, Director of Engineering for Inmarsat, said, "Anyone on the go should be able to use our satellites to communicate anywhere on Earth." Inmarsat was deployed 44 minutes after launch and will become fully operational by December in its orbit 23,000 miles above Earth. [Banke, **FLORIDA TODAY**, p. 6A, Oct. 31, 1990, Oates, **THE ORLANDO SENTINEL**, p. A-3, Oct. 31, 1990.]

October 31:

IVEY'S CONSTRUCTION CONTRACT

Ivey's Construction Inc. (Merritt Island, FL) has been selected by NASA to enter final negotiations for a \$6.4 million contract to construct a Space Shuttle Payload Canister Rotation Facility (PCRF) at Kennedy Space Center. The facility will serve as the high bay of the Transport Canister Reconfiguration, Maintenance and Storage Facility located in the KSC Industrial Area. This facility is used to reconfigure, refurbish and maintain the Space Shuttle Payload Canister. Ivey's Construction will also construct an annex building, which will provide office space, an equipment storage area and workspace for the new PCRF. [Kristofferson, **KSC NEWS RELEASE NO. 172-90**, Oct. 31, 1990, "Payload Canisters Get New Home," **FLORIDA TODAY**, p. 10E, Nov. 4, 1990.]



ATLANTIS: STS-38 STATUS

A flight readiness test of the three main engines began early this morning. This test includes a total check of the engines' electrical system and cycling of the engine valves. Closeouts of the aft compartment will begin November 1 and the two contingency space suits will be installed in the airlock November 2. As standard practice, two suits are always flown in the Shuttle in case of an unplanned space walk during the mission. Atlantis is scheduled to be launched November 9 on Mission STS-38, a classified Department of Defense flight. The launch window extends from 6:30 p.m. to 10:30 p.m. [KSC SHUTTLE STATUS REPORT, Oct. 31, 1990.]



COLUMBIA: STS-35 STATUS

"The team has found and fixed the problem and we can proceed with plans to launch Columbia," said Robert B. Sieck, Shuttle Launch Director, of the oldest Orbiter's tanking test. Sieck went on to say, "Launching Shuttles and reputation, they are tied together. Safely and successfully carrying out these missions, which is our goal, is only going to help the reputation and our cause to keep the program going." The Kennedy Space Center team yesterday successfully completed the liquid hydrogen tanking test of Columbia with no leakage. Data collected from the test is still being evaluated. However, no other work is planned on the liquid hydrogen system and another tanking test won't be necessary. During the test, main propulsion system feedlines, main engines and all associated components in the liquid hydrogen system were investigated. The aft compartment was specially outfitted with 10 cameras, bagged joints and instrumentation.

The tank was drained of liquid hydrogen and the residuals are being boiled off today. Boil off is estimated to be completed by about 4 p.m. and the Rotating Service Structure will be moved in place around the vehicle about 6 p.m. tonight. The pad will be reopened and access to the aft compartment is planned for early November 1. Work will begin then to deconfigure the aft from the test. NASA officials said the successful test at Kennedy Space Center indicates that replacing two defective seals and tightening nuts and connectors in the Columbia's engine compartment had repaired the hydrogen leaks that have grounded the Orbiter since May. [KSC SHUTTLE STATUS REPORT, Oct. 31, 1990, Leary, THE NEW YORK TIMES, p. A-14, Oct. 31, 1990, "Test Shows Columbia is Now 'A Tight Ship'," THE ORLANDO SENTINEL, p. A-3, Oct. 31, 1990.]



ENDEAVOUR ENGINES ARRIVE

The first of three main engines for the Space Shuttle Endeavour arrived at Kennedy Space Center today. The engines will be uncrated and inspected in the Vehicle Assembly Building Main Engine Shop. Engine number 2032 will be stored in the engine shop until Endeavour arrives in May of 1991. This engine features the improved controller with a larger capacity memory and upgraded with wire harnesses. [KSC SHUTTLE STATUS REPORT, Oct. 31, 1990.]



DISCOVERY POST-FLIGHT OPERATIONS

Preparations are underway to remove the right orbital maneuvering system (OMS) pod and the forward reaction control system (FRCS). The OMS pod is scheduled for removal November 2 and the FRCS removal is planned November 4. Both vehicle components will be transferred to the Hypergolic Maintenance Facility for post-flight inspections. Preparations are beginning to remove the three main engines late next week. [KSC SHUTTLE STATUS REPORT, Oct. 31, 1990.]



LAUNCH DELAY FOR ATLANTIS

Problems with its Department of Defense payload has caused a delay of from one to three weeks in the launch of Atlantis' STS-38 mission. The Air Force said that the launch was postponed to resolve problems discovered during cargo testing. Air Force spokeswoman Lt. Lewonnie Belcher said, "The details are classified and right now it's too early to declare a new launch date." NASA managers have not yet decided the question of moving up Columbia's launch date, but NASA spokesman Dave Steitz said, "That's not to say it won't be considered this morning or later." Preparations for the Atlantis mission have continued despite the payload problem; an electrical and mechanical test of the main engines started today and will continue through November 1. Two more Department of Defense missions are planned, both for 1991, but their cargoes are unclassified. "The bottom line is it's no longer affordable" to maintain secure operations for a mission, said a Pentagon official who spoke on condition of anonymity. [Brown and Banke, FLORIDA TODAY, p. 1A, Nov. 1, 1990, KSC SHUTTLE STATUS REPORT, Nov. 1, 1990, "Air Force Postpones Atlantis Flight," THE ORLANDO SENTINEL, Nov. 1, 1990.]

NOVEMBER

November 1: CRIPPEN STATEMENT: SHUTTLE STATUS

"NASA is working with the Air Force to help resolve the anomalies discovered during cargo testing. Due to the classified nature of the payload, details of the work being conducted cannot be discussed. I am confident that the launch team will resolve the problems so that Atlantis and the STS-38 mission can be launched. At this time, we are continuing to proceed with the schedule to fly STS-38 before STS-35. "With regard to Shuttle Mission STS-35, data from the tanking test on Columbia confirmed that the problem of excess hydrogen in the aft of the Orbiter had been resolved. Columbia and the Astro/BBXRT payload are now being prepared for flight. I am optimistic about flying the STS-35 mission sometime in December. A specific target launch date for the mission will not be determined until after the Flight Readiness Review has been conducted and performance data from the STS-38 mission has been analyzed." ["Statement by Shuttle Director Robert Crippen on STS-38 & STS-35 Mission Status," NASA NEWS RELEASE, Nov. 1, 1990, Brown, FLORIDA TODAY, p. 8A, Nov. 2, 1990.]

November 2: ATLANTIS SERVICING

The flash evaporator system water loop A on Atlantis has been deserviced today to allow the replacement of a valve module. The water loop will be reserviced November 3. Routine dye penetrant tests of the main engine high pressure fuel ducts are underway today. NASA is working with the Air Force to resolve the payload issue [see statement above], but an official launch date has not yet been set. [KSC SHUTTLE STATUS REPORT, Nov. 2, 1990.]

[] COLUMBIA: POST-TEST OPERATIONS

Work is underway today to remove cameras and lights from Columbia's aft compartment following the successful tanking test. Water valves for the auxiliary power units will be replaced and retested this weekend. Checks of the reaction control system regulators are planned today and early next week. The payload bay doors are open to access the Astro payload; the Broad Band X-Ray Telescope is being serviced today with argon. [KSC SHUTTLE STATUS REPORT, Nov. 2, 1990.]

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MCCARTNEY OPENS EXERCISE TRAIL

Kennedy Space Center Director **Forrest S. McCartney** today opened a new exercise trail near the Operations and Checkout Building in the space center's industrial area. The new three-quarter-mile trail was planned with an emphasis on muscle toning as well as cardiovascular conditioning and includes 20 different exercise stops. Dr. **Paul Buchanan**, Biomedical Operations and Research Office Director, said, "It's been well proven that exercise is a powerful antidote to stress and disease. This new outdoor trail will give employees a chance to enjoy the Florida outdoors while improving their health and well-being. It's a self-paced exercise opportunity, starting with stretching and warming up routines. Along the path are several different muscle-strengthening activities, followed by a 'cool down' zone that will provide stretching activities to end the exercise." [Phillips, KSC NEWS RELEASE NO. 178-90, Oct. 31, 1990.]

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ATLANTIS REPAIR WORK CONTINUES

NASA and the Air Force continued repair efforts on Atlantis' classified military payload today. "We still have no official launch date," said **Lisa Malone**, a Kennedy Space Center spokeswoman. The delay is expected to last from one to two weeks. The cargo problems were revealed during testing last week. [Brown, FLORIDA TODAY, p. 7A, Nov. 3, 1990.]

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COLUMBIA PREPARATIONS PROCEED

Columbia still awaits a December launch date, but Kennedy Space Center managers prefer to have at least three weeks between missions to review flight data and the delay in launching Atlantis also delays the launch of Columbia. Workers today replenished the coolant needed to protect the Broad Band X-Ray Telescope in Columbia's payload bay and the last of the equipment used in the earlier tanking test was removed from the Orbiter's aft compartment. [Brown, FLORIDA TODAY, p. 7A, Nov. 3, 1990.]

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DISCOVERY: ELECTRICAL SHORT

An electrical short in test equipment today forced technicians to cut power to Discovery during its extensive post-flight inspections and servicing. Kennedy Space Center spokeswoman **Lisa Malone** said that the flight processing of Discovery would not be effected by the electrical problem. [Brown, FLORIDA TODAY, p. 7A, Nov. 3, 1990.]

November 3:

SILVER SNOOPY AWARDS

Boeing Aerospace Operations Inc. employee **John Yancey, Jr.** has won the NASA Manned Flight Awareness Silver Snoopy Award; he was awarded a Silver Snoopy pin by astronaut **Curt Brown**. The pin flew aboard a secret Department of Defense mission aboard Atlantis in December 1988. Brown and astronaut **Michael McCulley** also awarded Silver Snoopys to five EG & G Florida Inc. employees: **Kenneth Clontz, Larry Gast, David Marches, Carol McCombs** and **Charles Hobday**. ["KSC Workers Receive Silver Snoopy Award," **FLORIDA TODAY**, p. 9E, Nov. 4, 1990.]

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SPACEPORT USA'S CHAMBERS RETIRES

H. B. Chambers, General Manager of Spaceport USA at Kennedy Space Center is retiring after 22 years. Under his direction, Spaceport USA has grown consistently and now attracts three million visitors annually. It is the fourth largest tourist attraction in Florida. Chambers will be succeeded by **Donald Hennessy** who has been regional vice president for Canteen Corp. (Kansas City, MO). Hennessy will serve as Chambers' deputy until January 1, 1991. ["Head of Spaceport USA to Retire After 22 Years," **FLORIDA TODAY**, p. 9E, Nov. 4, 1990.]

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ATLANTIS CARGO WORK CONTINUES

"While Atlantis will be launched ahead of Columbia, there is no official word on a launch date," said Kennedy Space Center spokesman **George Diller**. This weekend workers performed maintenance on part of the system used to keep the Orbiter and the crew cool in space and inspected plumbing within the three main engines. [Banke, **FLORIDA TODAY**, p. 2A, Nov. 4, 1990.]

November 4:

ATLANTIS LAUNCH PREPARATIONS

Work to ready Atlantis for the STS-38 launch is proceeding; closeouts of the Orbiter's aft compartment are in work. Dye penetrant tests of the main engine high pressure fuel ducts were successful. A functional check of the crew hatch was successfully completed this weekend. The two space suits are scheduled to be installed in the air lock tomorrow. Two suits are routinely flown on board Orbiters in case of an unplanned space walk during the mission. Tomorrow the Orbiter's flash evaporator system will be topped off. Purges of the external tank are planned for November 6. [KSC SHUTTLE STATUS REPORT, Nov. 5, 1990, KSC SHUTTLE STATUS REPORT, Nov. 6, 1990.]

November 5: COLUMBIA: HELIUM TEST SCHEDULED

A helium signature test of the liquid oxygen side of the main propulsion system of Columbia is scheduled for today. The tanking test disproved the existence of any leaks within the liquid hydrogen side of the system. Flow checks of the aft reaction control system are underway today. Work continues to restore the aft compartment to normal launch configuration. [KSC SHUTTLE STATUS REPORT, Nov. 5, 1990.]

□ DISCOVERY: PRE-LAUNCH PREPARATIONS

Operations planned today for Discovery include pulling the nose cap for structural inspections, checks of the S-Band Antenna, a test of the radar altimeter, and thermal protection systems operations. Over the weekend both the right orbital maneuvering system pod and the forward reaction control system were removed from the Orbiter and transferred to the Hypergolic Maintenance Facility for post-flight inspections. Heat shield removal is starting today in preparation for removing the three main engines later in the week. Functional testing of the waste containment system is scheduled this week. [KSC SHUTTLE STATUS REPORT, Nov. 5, 1990.]

□ ATLANTIS LAUNCH DATE

Kennedy Space Center Director **Forrest S. McCartney** said today his best guess on when Atlantis would be launched would be November 15, 16 or 17. Normally, NASA likes to have missions three weeks apart to allow time to study flight data and fix potential problems. "We're looking to see if we can make that shorter because we would like very much to fly and get Columbia home before Christmas," McCartney said. He said that schedule would allow certain KSC operations to close for maintenance and would save holiday pay, he said. Columbia's launch should follow that of Atlantis in three weeks, or less, McCartney said. [Banke, **FLORIDA TODAY**, p. 1A, Nov. 6, 1990.]

□ DRUGS, SHUTTLE ACCIDENTS NOT RELATED

"I think they are absolutely, totally unrelated," Kennedy Space Center Director **Forrest S. McCartney** said today. "There is no evidence at all to indicate that substance abuse of any kind has been a factor in any of the incidents that we have had." On November 2, a small bag of cocaine was found under a desk in a hangar where Orbiters are readied for launch. NASA has an ongoing investigation and no arrests have been made. McCartney added, "I think what we have is nothing more than an

individual that has, unfortunately, a habit, and we have happened upon the substance that they use."

In April, NASA began random drug testing of civil service employees in sensitive positions at KSC. Many of the center's contractors conduct pre-employment drug tests as well as tests of employees suspected of drug use. Leo Serrano, Director of a Wuesthoff Hospital (Rockledge, FL) laboratory, said of the drug find, "For the most part, our experience with the people at the space center has shown they're all very responsible individuals." According to statistics Serrano has compiled, the incidence of drug use at KSC is lower than at other places of employment.

Aerospace and defense industry employees tested positive for drug use 0.3 percent of the time, compared with the county-wide average of 8.3 percent, Serrano remarked. Construction and service industry workers tested positive 10 percent of the time, he said. One reason Serrano offered for the low drug use rate among space center employees is that aerospace and defense industries don't send prospective employees in for drug testing until a thorough background check has been completed. McCartney said that drug use at Kennedy Space Center must be curbed. Workers identified as drug users will be given the choice of drug rehabilitation or termination, he said. [Banke **FLORIDA TODAY**, p. 10A, Nov. 6, 1990.]

November 6: NASA ACCIDENT REPORT COMPLETE

The investigation team lead by former astronaut John Young has completed its investigation into a series of Orbiter processing accidents at Kennedy Space Center. The findings were presented to Associate Administrator for Space Flight William Lenoir this week. Lenoir is expected to discuss the findings tomorrow in his regular meeting with reporters. Young's panel was directed to determine whether there was any "common cause" to the series of mishaps that have led to damaged hardware and delays at KSC. [Banke, **FLORIDA TODAY**, p. 14A, Nov. 7, 1990.]

□ APU REPLACEMENT ON COLUMBIA

Auxiliary power unit number 1 will be replaced today and a hot fire is planned for next week. Installation of APU water valves is scheduled for today as well and will continue through tomorrow. Flow checks of the aft reaction control system have been completed and work continues on returning the aft compartment to its normal launch configuration. General purpose computer number 5 was replaced and will be tested November 7.

This computer failed during testing last week. [KSC SHUTTLE STATUS REPORT, Nov. 6, 1990, KSC SHUTTLE STATUS REPORT, Nov. 7, 1990.]

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NASA EAGLES LAY EGGS

A NASA video camera recorded a Southern Bald Eagle laying two eggs between November 2 and 6 in a pine tree near Kennedy Space Center. **Elliott Jones**, in an article for **FLORIDA TODAY**, wrote: "After the special event, recorded by an unmanned video camera poised next to the 40-foot-high nest, the white-headed father eagle let out a whoop. 'It was quite dramatic," said **Dorn Whitmore**, a wildlife specialist with the Merritt Island National Wildlife Refuge." [Jones, **FLORIDA TODAY**, pp. 1A-2A, Dec. 5, 1990.]

November 7:

DISCOVERY'S SCREEN TEST

Preparations are underway to perform tests on the right orbital maneuvering system pod at the Hypergolic Maintenance Facility. A new test, called a screen test, to check the propellant tanks' internal screen is scheduled for next week. Heat shield removal has begun in preparation for removing the three main engines November 9. The engines will be transferred to the engine shop in the Vehicle Assembly Building for refurbishment. STS-39 booster stacking operations have begun in the VAB today with the left aft booster being stacked on the mobile launcher platform. [KSC SHUTTLE STATUS REPORT, Nov. 7, 1990.]

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STS-38 & STS-35 LAUNCH ADVISORY

NASA managers today set November 15, 1990, as the new target launch date for Shuttle mission STS-38, a dedicated Department of Defense mission. Launch of Atlantis and the STS-38 mission was delayed from its original target date of November 9, 1990, due to payload problems. Start of the 4-hour launch opportunity period remains the same at 6:30 p.m. EST. This will be the seventh flight of Atlantis and the 37th Space Shuttle mission. Preparations for the launch of Columbia and the STS-35/Astro-1 mission continue on schedule at Launch Complex 39B. The Flight Readiness Review (FRR) for STS-35 is currently scheduled for November 26-27, 1990. Following analysis of performance data from STS-38 and the standard review of mission status at the FRR, a target date for the Astro-1 mission will be announced. "Processing of Atlantis for the STS-38 mission is going well," said Space Shuttle Director **Robert Crippen**. "If the remaining scheduled work for STS-38 goes as planned and no unexpected obstacles arise, I'm confident that we will launch on November 15th and that we'll be flying Columbia sometime in early December." [Hess,

Campion and Malone, "Launch Advisory for Shuttle Missions STS-38 and STS-35," Nov. 7, 1990.]

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ATLANTIS: DOD PAYLOAD READY

The Department of Defense's classified payload has been repaired and is ready to fly aboard Atlantis. "We're reasonably confident we can make the 15th [Nov.]," said Shuttle Program Director **Robert Crippen**. The launch will come sometime between 6:30 p.m. and 10:30 p.m., officials said.

NASA also announced today that an investigative team led by former astronaut **John Young** did not find a "common cause" for a series of Shuttle processing accidents at K. The group examined nine serious accidents at the space center over the past 13 months. The primary cause of most of the accidents, said the Young panel, was a lack of training and failure to write work procedures clearly. A failure to follow work procedures was noted. I made several recommendations: (1) team engineers and technicians in the workplace; (2) train technicians to specialize in certain processing tasks; (3) improve communications between supervisors and technicians. [Halvorson, **FLORIDA TODAY**, p. 7A, Nov. 8, 1990.]

November 8:

MINOR COLUMBIA MISHAP

During routine operations yesterday in the payload changeout room at Launch Pad 39B, an aluminum pan beneath an access platform nicked a thermal blanket covering part of the Astro-1 Star Tracker. The area of impact on the blanket measured about 1/4 inch long by 1/8 inch wide, with the depth termed "barely perceptible." At present, no impact is seen on Columbia's upcoming flight. The Broad Band X-Ray Telescope is being serviced today with liquid argon. Ultraviolet Imaging Telescope film removal has been accomplished. New film will be loaded prior to launch. Routine payload monitoring will continue. Other preflight work scheduled includes loading the mass memory unit (MMU) with new mission data, plus experiment closeouts, pallet cleaning, and BBXRT servicing. [STS-35/ASTRO-1 STATUS REPORT, Nov. 8, 1990.]

November 9:

COLUMBIA: BBXRT SERVICED

The Orbiter's hydraulic system is being conditioned for the engine flight readiness test tomorrow. A hot fire of auxiliary power unit number 1 is planned for November 12. Today, technicians will service the APUs lubricating oil; APU water valves have been installed and functional tests have been completed. Columbia and the Astro payload are being prepared

for launch on Mission STS-35. [KSC SHUTTLE STATUS REPORT, Nov. 9, 1990.]

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DISCOVERY PREPARATIONS IN OPE

Engine drying operations on Discovery are complete and preparations are underway to remove the three Space Shuttle Main Engines (SSMEs) November 10. They will be transferred to the main engine shop in the Vehicle Assembly Building to be refurbished. Freon coolant loop number 1 was deserviced last night and the radiator is scheduled to be removed tonight. Inspections of the payload bay doors are planned following the radiator's removal. Testing continues on the right orbital maneuvering system (OMS) pod at the Hypergolic Maintenance Facility. A dry run of a screen test was completed yesterday. Booster stacking for STS-39, Discovery's next mission, continues in the VAB. The first segment, the left aft booster, has been stacked on the mobile launcher platform and will be followed next week by the left aft center segment. [KSC SHUTTLE STATUS REPORT, Nov. 9, 1990.]

November 10: ATLANTIS LAUNCH PREPARATIONS

"We're doing pretty good and are not tracking any major problems," said Lisa Malone, Kennedy Space Center spokeswoman. Launch preparations of Atlantis proceeded without a hitch November 8 and 9 as technicians prepared today to close Launch Complex 39A for hazardous operations on the Orbiter. Workers will make the final connections of ordnance on the Shuttle and pressurize tanks inside Atlantis containing toxic rocket propellants. Technicians also planned to complete reconfiguration work in the aft engine compartment and to attach the compartment's access doors to the Orbiter. The countdown begins at 10:30 p.m. November 11. On November 13, Atlantis Commander Richard Covey, Pilot Frank Culbertson and Mission Specialists Charles "Sam" Gemar, Carl Meade and Robert Springer arrive at the space center to prepare for November 15's launch. [Banke, FLORIDA TODAY, p. 6A, Nov. 10, 1990, Halvorson, FLORIDA TODAY, p. 4A, Nov. 12, 1990.]

November 11: ATLANTIS' COUNTDOWN STARTS

At 10:30 tonight the countdown begins for Atlantis' STS-38 mission. The flight is on behalf of the Department of Defense and the payload is classified, but it has been widely reported that the satellite in Atlantis' cargo bay is equipped with cameras and sensors that will help support U. S. operations in the Middle East. Yesterday, technicians at Launch Complex 39A finished installing ordnance devices used to separate the

Orbiter from its external tank and solid rocket boosters during ascent. Today, Atlantis' on-board fuel storage tanks will be pressurized and final checks of its rear engine compartment will be completed. Dick Young, Kennedy Space Center spokesman, said, "They're running somewhat ahead of schedule," referring to launch processing. Liftoff will occur between 6:30 p.m. and 10:30 p.m. November 15. [Brown, FLORIDA TODAY, p. 10A, Nov. 11, 1990.]

November 12: TWO MILITARY LAUNCHES THIS WEEK

About 7:00 p.m. today an Air Force Titan 4 will lift off from Cape Canaveral Air Force Station; Thursday evening between 6:30 and 10:30 Atlantis is scheduled to be launched from Kennedy Space Center's Launch Complex 39A. The Air Force will not discuss the Titan's cargo; the same is true for Atlantis' cargo. The Shuttle countdown was begun a day earlier than usual and space agency officials would not discuss the change. [Brown, FLORIDA TODAY, p. 1A, Nov. 12, 1990.]

□ ATLANTIS COUNTDOWN UNDERWAY

All Atlantis countdown events are proceeding without problems. Closeouts of the aft compartment are complete; one of the flight doors was installed early this morning and workers are attaching another door today. KSC launch team members are involved in routine operations to ready the STS 38 vehicle for liftoff. Some of these jobs include loading software into the Orbiter's onboard computers, checking out the main engine controllers for flight and preparations to load the Orbiter's onboard fuel cells with liquid hydrogen and liquid oxygen reactants.

Ordnance devices were installed on the weekend and the firing circuits were checked. Atlantis' hypergolic propellant tanks have been pressurized for flight. Weather forecasts for the launch period November 15 indicate there is a 40 percent chance that the overall conditions will be acceptable for liftoff. Launch day weather concerns are crosswinds at the KSC Shuttle Landing Facility, chance of ceilings below 8,000 feet and showers in the area. Scattered clouds are forecast between 4,000 and 7,000 feet and between 30,000 and 33,000 feet. Winds are expected to be out of the northeast at 12 knots with peak winds at 25 knots. [KSC SHUTTLE STATUS REPORT, Nov. 12, 1990.]

□ COLUMBIA PASSES MAIN ENGINES READINESS TEST

A flight readiness test of Columbia's three main engines was completed this past weekend. This test verified the engines' electrical systems and

cycled the valves. A hot fire of the auxiliary power unit number 1 is planned for this afternoon. [KSC SHUTTLE STATUS REPORT, Nov. 12, 1990.]

November 12: TITAN 4 LAUNCH SUCCESS

Air Force Titan 4 Program Manager Col. Frank Stirling called tonight's mission a success. The 18-story Titan 4 launch vehicle lifted off from Cape Canaveral Air Force Station at 7:37 p.m. "This is another significant launch for America's space program," said Martin C. Faga, Air Force Assistant Secretary for Space. The satellite aboard the Titan 4 is expected to undergo extensive systems checks for the next two or three months before becoming operational. Originally scheduled for a September launch, the Titan 4 launch was delayed by a nitrogen tetroxide leak and again when the rocket's nose cone had to be removed and cleaned. Today's launch was the third for the \$173 million Titan 4. [Halvorson, FLORIDA TODAY, p. 1A, Nov. 13, 1990, Hoversten, USA TODAY, p. 3A, Nov. 13, 1990.]

November 13: CONFISCATED POWDER NOT COCAINE

The bag of white powder found in a Shuttle processing hangar on November 2 has proved to be "calcium hydrogen phosphate, which is not a controlled substance," said Kennedy Space Center spokesman Dick Young. According to Scott McCord, a Titusville High School teacher, the chemical is commonly used in chemistry classes for various experiments and is also used in the aerospace industry to calibrate machinery. [Halvorson, FLORIDA TODAY, p. 1A, Nov. 14, 1990.]

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STS 38 CREW ARRIVES AT KSC

The all-military crew of STS-38 arrived at Kennedy Space Center today in preparation for the scheduled launch of Atlantis November 15. Air Force weather officials, however, say there is a 70 percent chance that winds will be too high for launch. The winds result from a high pressure Canadian weather system heading for Florida where it will the system will likely encounter a low pressure tropical system which is expected to move into the Space Coast from the south. The convergence will likely produce strong crosswinds at the Shuttle Landing Facility. High winds would make it difficult to land the Orbiter at KSC should an emergency occur during the first four minutes of flight. Wind speed could also damage the Shuttle during launch.

On arrival at about 5:30 p.m., nonetheless, Commander Richard Covey said, "It's great to be back down here." He referred to previous trips to

Florida when the launch of Atlantis had to be canceled due to liquid hydrogen fuel leaks which are now repaired. The crew also includes: Pilot **Frank Culbertson**, and Mission specialists **Robert Springer**, **Charles "Sam" Gernar** and **Carl Meade**. The astronauts were welcomed with a banner which read "Go Atlantis, STS-38."

"The countdown is underway and we haven't had any problems so far," said **Lisa Malone**, KSC spokeswoman as launch preparations continued without a hitch; meanwhile, workers loaded tanks inside Atlantis with liquid hydrogen and liquid oxygen. The chemicals are used to generate electricity and drinking water during the flight. Countdown activities completed include loading software into the Orbiter's onboard computers, activating and testing the Orbiter's navigation aids and checking out the main engine controllers for flight. [Banke, **FLORIDA TODAY**, p. 6A, Nov. 14, 1990, **KSC SHUTTLE STATUS REPORT**, Nov. 13, 1990, **KSC SHUTTLE STATUS REPORT**, Nov. 14, 1990.]

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COLUMBIA PROCESSING CONTINUES

A hot fire of Columbia's auxiliary power unit number 1 was conducted about 11:50 p.m. The rotating service structure will be moved in place around the vehicle tomorrow morning. Workers will establish access to the aft compartment and begin post-hot fire inspections. The APU 1 fuel tank will be topped off and repressurized later in the day. The Flight Readiness Review for Columbia's STS-35 mission will be held at Kennedy Space Center November 26 and 27. [**KSC SHUTTLE STATUS REPORT**, Nov. 13, 1990.]

November 14: WEATHER IMPROVES; ATLANTIS GO

NASA officials said today there is a 60 percent chance the weather will be favorable for launch the Shuttle Atlantis should be ready to go. "The vehicle looks good and the countdown is proceeding without a hitch," said KSC spokesman **Bruce Buckingham**. The exact time of the Department of Defense STS-38 mission will not be announced until nine minutes before launch, but liftoff is expected to come during a launch window extending from 6:46 to 8:12 p.m. November 15. Today, pad workers completed activation of the Orbiter's communications system, tested the Orbiter's navigation aids, prepared the tail service masts for launch and installed the crew seats in the crew cabin. The Rotating Service Structure will be moved to the launch position away from the vehicle, the gaseous oxygen vent arm will be prepared for launch, and the inertial measurement units will be activated and warmed up.

There remain some launch day weather concerns about crosswinds at the Shuttle Landing Facility. Scattered clouds are forecast between 4,000 and 7,000 feet and between 30,000 and 33,000 feet. Winds are expected to be out of the east at 15 knots gusting to 25 knots. Today, the STS-38 crew will fly in their T-38 training jets and receive routine status briefings on the vehicle, payload and weather. [KSC SHUTTLE STATUS REPORT, Nov. 14, 1990.]

□ 39B CLEARING FOR ATLANTIS LAUNCH, ORDNANCE

Preparations are underway to top off and repressurize Columbia's hydrazine tank for auxiliary power unit number 1 today. Only those personnel essential to the job will be allowed into the pad. The first part of ordnance operations is planned for November 16. Again the pad will be cleared during this operation. On November 15, the pad will be cleared from 8:00 a.m. till late in the evening due to the launch of STS-38. [KSC SHUTTLE STATUS REPORT, Nov. 14, 1990.]

□ DISCOVERY'S LAUNCH PREPARATIONS

Operations scheduled for Discovery this week include structural inspections of the nose cap and inspections of thrusters on the left orbital maneuvering system pod. Radiator panels were removed and inspections of the payload bay doors are planned. A screen test of the fuel tanks on the right orbital maneuvering system (OMS) pod is planned today. The pod is located presently at the Hypergolic Maintenance Facility. Booster stacking operations for STS-39 (Discovery) are continuing in the Vehicle Assembly Building. The second segment, the left aft center segment was pinned to the booster last night. The left forward center segment was transferred to the VAB early this morning and is scheduled to be lifted to the high bay in the VAB this morning. This segment will be mated by November 16. [KSC SHUTTLE STATUS REPORT, Nov. 14, 1990.]

□ LAST OF SECRET SHUTTLE FLIGHTS

The launch of Atlantis will be the last classified Department of Defense mission for the Shuttle, though two unclassified missions will take place next year. Over the next five years, half of Kennedy Space Center workers - about 8,000 - will lose their security clearances, according to KSC Security Chief Gary Wistrand. Workers holding secret clearances are re-investigated every five years and most of the approximately 8,000 who are due to lose their clearances will simply not have them renewed. The exception, according to Wistrand, is for security personnel who must have

immediate access to any KSC facility. About 35 persons whose work was devoted entirely to maintaining military Shuttle Program security - such as classified document handling and communication systems configuration - are being phased out of those jobs and reassigned to other duties. "We began preparing for this about two years ago, so most workers that would be impacted have been placed in other positions," Wistrand said.

Kennedy Space Center will gain in one respect; the space center will have sole control of a second fully-equipped control room needed to test and launch the Shuttle. The room, from which Atlantis will be launched, is a secure, dedicated Department of Defense facility. After the launch, the control room - and a second, less-equipped facility in the KSC Launch Control Center - will be turned over to NASA and refitted for civilian space applications at a cost of \$6 million which will be borne by the Department of Defense. Launch Director **Robert Sieck** says the additional rooms are not expected to affect Shuttle processing operations, although having them will provide managers with more flexibility. "We use it now for non-secure mission operations," Sieck said. "The only time we got into a bind was when we had two Defense Department flights in a flow." [Brown, **FLORIDA TODAY**, pp. 1A-2A, Nov. 15, 1990.]

November 15: ROADS CLOSED FOR LAUNCH

Kennedy Parkway and NASA Causeway will close today at 12:30 p.m. because of Pentagon plans to launch a classified cargo aboard Atlantis tonight. Spaceport USA will close two hours later and tourists will be ordered to leave the grounds, officials said. Families with car passes will be admitted after 2:30 p.m. Car passes for the public are not available for Pentagon launches. ["KSC to Close Roads for Shuttle Launch," **FLORIDA TODAY**, p. 8A, Nov. 15, 1990.]

□ GRANT FOR APOLLO TOWER GROUP

The Apollo 11 Society today received a \$25,000 grant from the Florida Bureau of Historical Preservation to aid in the reconstruction of the launch tower from which the Apollo 11 mission left for the moon. The tower was cut into sections in 1981 and is stored in a fenced area in the rear of the Kennedy Space Center Industrial Area.

The National Park Service has asked the Apollo 11 Society to conduct a study to determine the best site for the tower. In October, the U. S. House of Representatives supported the concept of naming the tower a national monument. Several locations in Titusville are being considered for the erection and the city has given another \$25,000 to the project. Titusville's

Senior Planner **Wes Hoaglund** intends to ask the Brevard County Tourist Development Council for \$50,000. It will cost at least \$20 million to reconstruct the tower, depending on the project design. The Society plans to choose a national spokesman to spearhead the fund-raising effort. For information about the Society and becoming a member, call 269-7224. [Long, **FLORIDA TODAY**, p. 3B, Nov. 16, 1990.]

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STS-38 LAUNCH SUCCESSFUL

The official liftoff time for STS-38 was 6:48:15, according to a news release from Kennedy Space Center just after nine o'clock tonight. NASA Administrator **Richard Truly** said, "It's an important mission for the Shuttle, an important mission for the Defense Department and the country, and I'm glad we've got another one airborne. We've got a good bird, a healthy crew and a good mission on the way." During the extremely smooth countdown, Commander **Richard Covey** told Launch Director **Robert Sieck**, "We're ready to get out of town." Because the mission is a classified one for the Department of Defense, little new information will be released to the press until the Atlantis is ready to land at Edwards Air Force Base, CA. Nevertheless, the cargo is expected to be deployed within 24 hours of launch.

The launch countdown actually began on Sunday and was interrupted on Monday for six hours to allow an unmanned Titan 4 to be launched from Cape Canaveral Air Force Station. Tanking operations began at 10:20 this morning and no significant fuel leaks were reported during the process of propellant loading. After donning their flight suits, the Covey and Pilot **Frank Culbertson** and Mission Specialists **Robert Springer**, **Carl Meade** and **Charles "Sam" Gemar** left their quarters in the Operations and Checkout Building and, at 3:35 p.m., headed for Launch Complex 39A, arriving at about 4 p.m.

Next year's Shuttle schedule includes two unclassified Department of Defense missions: a Strategic Defense Initiative Organization spacecraft aboard Discovery in February or early March and a missile-warning satellite will be deployed from a Shuttle next summer. The launch of Columbia on STS-35 is expected to take place in early December. The mission has been scrubbed four times since May due to fuel leaks and an electrical problem with the payload. [Halvorson, **FLORIDA TODAY**, pp. 1A-2A, Nov. 16, 1990, "Atlantis Launched on Secret Mission," **USA TODAY**, p. 3A, Nov. 16, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-5, Nov. 16, 1990, Leary, **THE NEW YORK TIMES**, p. A13, Nov. 16, 1990.]

November 16:

POST LAUNCH OPERATIONS

Post launch securing operations are underway at Launch Complex 39A today. The mobile launcher platform will be transferred back to the Vehicle Assembly Building on November 19. Launch damage to the pad was reported minimal; the liftoff scorched some paint on the launch tower and singed nearby grass, according to Kennedy Space Center spokesman **Bruce Buckingham**. At sea, the booster retrieval operations are underway. Recovery teams station-kept the boosters overnight and began retrieval activities at sunrise this morning. The parachutes are on board and work to secure the boosters for tow is underway. The boosters are expected to enter Port Canaveral November 17 by about 7 a.m. [KSC SHUTTLE STATUS REPORT, Nov. 16, 1990, Banke, FLORIDA TODAY, p. 1A, Nov. 17, 1990.]

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COLUMBIA'S DISCONNECT REPLACED

A leaking quick disconnect for main engine 1 is being replaced today. A flight readiness test on that engine to retest the disconnect is planned tomorrow. Hydraulic fluid is being conditioned in preparation for the test which cycles engine valves. The first part of ordnance operations is planned for November 18; the pad will be cleared during this operation. The two contingency space suits are scheduled to be installed in the air lock early next week. Launch Complex 39B was cleared most of November 15 for the STS-38 launch. A launch date for the STS-35 mission will be set following November 27's Flight Readiness Review. [KSC SHUTTLE STATUS REPORT, Nov. 16, 1990.]

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DISCOVERY GETS NEW COMPUTERS

Five new general purpose computers (GPCs) were installed in Discovery this week. STS-39 will be the first use of the upgraded GPCs. Today, an ammonia boiler and the Ku-Band Antenna drive assembly will be replaced. A screen test of the fuel tanks on the right orbital maneuvering system pod will be conducted again today. A retest is necessary because data collected from November 14's test is not fully understood. The pod is currently located at the Hypergolic Maintenance Facility. STS-39 booster stacking operations are continuing in the Vehicle Assembly Building. Mating of the left forward center segment to the stack is underway today. The left forward segment, the last motor segment, is scheduled to be mated next week prior to the Thanksgiving holidays. [KSC SHUTTLE STATUS REPORT, Nov. 16, 1990.]

November 18: ATLANTIS LANDS TODAY, EDWARDS

Weather permitting, Atlantis is scheduled to land today on Runway 15 at Edwards Air Force Base at approximately 4:48 p.m.; because Mojave Desert conditions typically get worse as the day progresses, the Shuttle will land one orbit earlier than planned. Forecasts for California call for gusty winds and a chance of rain which might cause a landing delay of one day, though the forecast for November 20 is not much better.

While in orbit, Atlantis Commander **Richard Covey** delivered a statement to the American forces stationed in the Middle East: "During the last few days we aboard Atlantis have circled Earth many times. Whenever we pass close to Saudi Arabia we could not help but think of our soldiers, sailors, airmen and Marines deployed there for Operation Desert Shield. As the holiday season approaches, the multi-service crew of Atlantis wishes these brave warriors peace and a speedy return home. Our prayers are for them and their families."

Department of Defense Shuttle missions carrying classified cargo tend to give out little information to the press; yesterday brought these brief remarks from Mission Control spokeswoman **Kari Fluegel**, "The crew is doing well and beginning landing preparations, and Atlantis continues to perform satisfactorily. [Banke, **FLORIDA TODAY**, p. 1A, Nov. 19, 1990, "Atlantis Readies for Today's Landing," **USA TODAY**, p. 3A, Nov. 19, 1990.]

November 19: ORBITER, SRB STATUS

At the NASA Ames-Dryden Flight Research Facility at Edwards Air Force Base, preparations are underway for the landing of the Space Shuttle Atlantis this afternoon, scheduled for 4:48 p.m. Eastern time. This is one orbit earlier than previously planned because of an approaching cold front. The Shuttle Training Aircraft will be making approaches to the Rogers Dry Lake Bed to assess the landing conditions. Landing officials feel reasonably sure that the weather will permit a de-orbit to occur this afternoon. On November 17, the STS-38 solid rocket boosters arrived at Hangar AF Booster Disassembly Facility on Cape Canaveral Air Force Base towed by the recovery ships Independence and Freedom. The initial inspections are complete and nothing surprising has been found. The segments are being disassembled for further routine inspections.

At Launch Complex 39A the crawler transporter is moving the mobile launcher platform back to the Vehicle Assembly Building this morning. At Launch Complex 39B, preparations continue for the launch of the Space

Shuttle Columbia and its Astro astronomy payload. Today, software is being loaded into Astro's mass memory unit, the camera on the ultraviolet imaging telescope is being loaded with film, and the Broadband X-Ray Telescope is being serviced with liquid argon. At the perimeter of Launch Complex 39B tankers are delivering to the liquid hydrogen and liquid oxygen to the pair of large storage spheres. On the fixed service structure, the Orbiter mid-body umbilical will be connected to Columbia today and leak-checked. Over the weekend, the hydraulic re-test of main engine #1 was completed on November 17, servicing the auxiliary power units with water was completed, and some initial ordnance work was done the next evening. On Discovery in its hangar at the Orbiter Processing Facility, powered-down electrical work is underway. A functional check is scheduled for the door of the Orbiter access hatch which will be followed by cabin leaks and other cabin functional testing. [KSC SHUTTLE STATUS REPORT, Nov. 19, 1990.]

November 20: WEATHER DELAYS ATLANTIS LANDING

Atlantis' attempt to land in California yesterday was delayed by gusting Mojave Desert winds; three chances to land are available today and the Orbiter has the capability to stay in space until November 22. NASA's Director of Mission Operations, Randy Stone, said that forecasts are more promising for today with clearing skies; wind is expected to remain strong. If weather at Edwards continues to present problems, Atlantis may be directed to land at Kennedy Space Center. Here at the space center workers are standing by should the Orbiter land here today. Such an event is considered unlikely, but a decision will be announced by noon today. There has not been a landing at KSC since Discovery blew a tire landing in 1985. Landings at the space center have been on hold since the Challenger accident, while new Orbiter equipment has been tested and weather forecasting refined to make attempts to land safer. [Banke, *FLORIDA TODAY*, p. 1A, Nov. 20, 1990, "Shuttle Atlantis Tries to Land Again Today," *USA TODAY*, p. 3A, Nov. 20, 1990.]

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FIRST KSC LANDING SINCE 1985

The Space Shuttle Atlantis accomplished this afternoon what no Orbiter had done since Discovery ended its STS 51-D (STS-23) mission on April 19, 1985. Atlantis made a smooth landing on Kennedy Space Center's Shuttle Landing Facility at 4:42 p.m. "It's great to have her home, and right here where she left..." said KSC Director Forrest S. McCartney. "It's a sight more rare than a launch here." Astronaut Ken Bowersox, who was communicating with the Shuttle crew from Mission Control at Johnson

Space Center (Houston, TX) spoke to Atlantis saying, "Welcome home. That sure was a pretty sight."

After passing over Florida's west coast, Atlantis flew across Central Florida, over the Titusville-Mims area and across KSC. The Orbiter flew briefly out over the Atlantic Ocean and circled for its landing approach from the southeast. Two minutes before the landing and ten miles from the runway at about 15,500 feet, Atlantis received "ground-based microwave signals to compute proper steering commands." Flare (or pull-up) maneuvers brought the Shuttle to its proper approach angle. The crew then deployed the Orbiter's landing gear 15 seconds before touchdown while at an altitude of 200 feet and still 5,000 feet from the runway. The Orbiter landed at 215 miles per hour about 2,750 feet beyond the beginning of the 15,000-foot shuttle landing facility. The runway itself is 300 feet wide and has a 1,000-foot safety overrun at each end.

Atlantis had been scheduled to land at Edwards Air Force Base in California, but bad weather postponed the return for a day. Unsafe winds and damp runways at Edwards forced the space agency to consider a KSC landing. When forecasters reported that weather would be worse at both Edwards AFB and Kennedy Space Center on November 21, NASA ordered the Atlantis crew to make its de-orbit burn and head for Florida.

Launch Director Robert B. Sieck said, "This is a great boost for the processing team. Most of them don't have the opportunity to see the real results of their work, which is the completion of the mission, the culmination of the effort. It's a real treat for them. I think it's appropriate that it's close to Thanksgiving. We have a lot to be thankful for - a safe and successful mission, the crew returning safely and the Orbiter looks in really good shape." Before leaving the space center to return to Houston, Commander Richard Covey said, "The KSC folks did a good job getting ready for us. They did a super job getting us out of town last Thursday night. We're anxious now to go on back to Houston and catch up with our families."

Civil Service and contractor employee spectators had to hustle to get ready for Atlantis' return. On hand at the runway to view the return were about 250 people, including two busloads of workers from the Launch Control Center (LCC) who watched the landing from bleachers and a strip of grass near the landing facility. They whistled, cheered and waved small American flags. A convoy of support vehicles had to be assembled and extra personnel were brought in. "We've had a contingency plan for some time to land the Orbiter here," said Director McCartney. "We had been ready for it and, quite frankly, we didn't make any [extra] preparations."

NASA Associate Administrator for Space Flight William Lenoir, acknowledge the safe return of Atlantis but said that NASA won't resume routine landings at Kennedy anytime soon. Center Director McCartney said, "We want to test the new (carbon) brakes some more, improve the nosewheel steering and put drag chutes on all the Orbiters before we begin landing here regularly again. But this clearly demonstrated we can bring them in here and do it safely."

NASA officials said at a night press conference that they had no fears about using the Shuttle Landing Facility at Kennedy Space Center, but they said it would remain a backup landing site. "We have no hesitation whatsoever to return to the Cape," said Lenoir. He said that since the crew was familiar with both KSC and Edwards, the late change in landing sites made little difference. Atlantis' landing here was only the sixth of the Shuttle Era; Discovery's April 1985 landing ended with a blown tire and damaged breaks. Then the Challenger accident happened in January the following year. Among the many Rogers Commission recommendations following the Presidential Commission's investigation of the accident was the following: NASA should land all Shuttles at Edwards Air Force Base until the three remaining Orbiters had been outfitted with upgraded brakes, tires and steering systems.

Since the accident, orbiter landing gear has been "stiffened" and hydraulic systems have been modified to make landings safer. Additionally, more than \$635,000 was spent in 1987 to smooth the grooved ends of KSC's runway to reduce wear on Orbiter tires. Among the improvements not yet made: More powerful (carbon) brakes have been flown twice this year on Discovery; Atlantis flew with the older beryllium brakes, the pre-Challenger system. An improved nosewheel steering system is planned for installation on all Orbiters, but has not yet been placed in any of the Orbiters. Endeavour, the Challenger's replacement, will be the first Orbiter to fly with the new drag chute in 1992. The other Orbiters will get the chutes by the mid-1990s.

The Presidential Commission also recommended that forecasters must be able to better predict the weather at Kennedy Space Center because flight directors give the order to land some 90 minutes before it actually occurs. Florida Today reports that meteorologists have been predicting local weather patterns with 95 percent accuracy in simulations conducted over the past two years. The weather at Edwards is acceptable 90 percent of the time; KSC weather is acceptable between 40 and 50 percent of the time. Finally, the landing at Kennedy Space Center saved NASA about \$1.8 million which is the usual cost of ferrying Atlantis from California to Florida. It also saved seven days usually lost in processing time for

Atlantis' next mission: the Gamma Ray Observatory in April 1991. [Halvorson and Banke, **FLORIDA TODAY**, pp. 1A-2A, Nov. 21, 1990, Banke, **FLORIDA TODAY**, p. 2A, Nov. 21, 1990, Corbitt, **FLORIDA TODAY**, p. 2A, Nov. 21, 1990, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-6, Nov. 21, 1990, "Atlantis Lands Safely at Cape Canaveral," **USA TODAY**, p. 3A, Nov. 21, 1990, Johnston, **THE NEW YORK TIMES**, p. A11, Nov. 21, 1990.]

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POST LANDING REPORT

The STS-38 astronauts left Kennedy Space Center at about 9 p.m. tonight bound for Houston, TX. Before leaving, Mission Commander Richard "Dick" Covey praised the work of the KSC team in supporting landing, and noted that it was exciting to land back at their original launch site. Covey, Pilot Frank Culbertson and Mission Specialists Sam Gemar, Robert Springer and Carl J. Meade all returned to Houston to spend the Thanksgiving holidays with their families. Initial indications reveal minimal tile damage and the tires and brakes were reported to look good. All systems functioned properly during descent.

The Orbiter Atlantis was safed and towed to the Orbiter Processing Facility tonight beginning at about 8:45 p.m. and arriving at 10:47 p.m. There, technicians will put in about 40 hours of work preparing the Shuttle for the Thanksgiving holiday standdown. The work in high bay 2 will include jacking and levelling, connecting of purges and connecting the Orbiter to ground power. Atlantis landed at KSC today at 4:42:43 p.m. on Runway 33. Mission managers pronounced the landing as flawless. Rollout distance was 8,900 feet, and wheel stop was at 4:43:27 p.m. The mission duration was 4 days, 21 hours, 54 minutes, and 28 seconds. After the holiday, mission management team members will gather at Kennedy Space Center for the Flight Readiness Review of Columbia's STS-35 Astro-1 mission. They are expected to set a date at the conclusion of the meeting November 27. The mission is expected to begin in the first week of December. [KSC SHUTTLE STATUS REPORT, Nov. 20, 1990, KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Nov. 21, 1990.]

November 21: COLUMBIA PRELAUNCH PREPARATIONS

Preparations for the launch of the Shuttle Columbia (OV 102) will begin winding down today to allow work crews time off for the Thanksgiving holidays. Work will resume at Launch Complex 39B November 24. Today, the external tank purges have been completed and the mass memory units are in the final stages of being loaded for flight on the Orbiter. The access platform will be removed from the payload bay and

the doors closed today for the holidays. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Nov. 21, 1990.]

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DISCOVERY: OPF BAY 1

Ammonia boiler decay checks continue today on Discovery in the Orbiter Processing Facility. The left hand brakes and wheels have been installed on the vehicle and the freon coolant line will be brazed into place today. The main engines are scheduled for installation following the Thanksgiving holidays. At the Hypergolic Maintenance Facility, screen tests continue on the reaction control systems. In the Vehicle Assembly Building, a small imperfection was discovered on the left forward solid rocket booster segment between the propellant and the inhibitor. The segment will be moved outside the VAB where crews will repair the problem. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Nov. 21, 1990.]

November 22: THREE PERCENT WORK THANKSGIVING

Only three percent of the 18,000 Kennedy Space Center employees - about 520 contractor and 30 civil service workers - were on hand at the space center today; about the same number are expected to be at work tomorrow, according to KSC spokesman **Bruce Buckingham**. "They were just kind of standing guard while the rest of the work force took the holiday off." Today's Shuttle tasks included draining unused fuels from Atlantis' onboard storage tanks in the Orbiter Processing Facility. Those not at work in the OPF were mainly a contingent of security officers and firefighters, Buckingham said.

When technicians report to work at Launch Complex 39B November 24, they will continue efforts to get Columbia ready for launch, perhaps as early as December 2. Their first job will be to replace a faulty valve connecting ground support equipment to the Orbiters auxiliary power units. The valve problem was noted during a recent test at the pad. Work will continue in prepping Columbia's aft compartment for flight. NASA managers expressed confidence today that Columbia is in good shape. Director of Shuttle Operations at KSC **James Harrington** said, "The team is ready to go; everybody is anxious to get Columbia off the ground." [Halvorson, **FLORIDA TODAY**, p. 7A, Nov. 23, 1990, Halvorson, **FLORIDA TODAY**, p. 4A, Nov. 24, 1990.]

November 26: HUBBLE REPORT HITS NASA, MAKER

Flaws in the manufacture of the Hubble Space Telescope are attributable in part to "the same management climate" which led to the Challenger

accident, reported **FLORIDA TODAY** newspaper today. Panel member **John Mangus** said that in both cases engineers were discouraged from bringing potential problems to the attention of their superiors. Another panel member said that upper-level managers never were told about problems that surfaced during tests of the equipment.

"There were signs of concern regarding the technical aspects of the project," said **Roger Angel**, an astronomy professor at the University of Arizona. "The people conducting the tests knew about them [the problems], but the information never made it to the higher levels of personnel. But there was no suppression of data." The panel's report concluded that both the telescope's manufacturer and NASA were to blame for the flawed mirror on the HST. Angel said that NASA should use the report to improve its dealings with contractors.

Hubble's flaw was caused by a technician's mistake, but program managers approved the quality-control program that allowed the mistake to occur undetected. Among other conclusions the report noted: "Mirror-testing that was done relied too heavily on a single instrument, which had been assembled improperly. Relatively simple 'sanity checks' should have been done to make sure the mirror-polishing system was working properly. There was too little contact between those working on the mirror and NASA project supervisors who could have understood the test results. Quality-control inspectors lacked the expertise in optics to understand results of some tests that showed a flaw in the mirror. [Easton, **FLORIDA TODAY**, pp. 1A-2A, Nov. 26, 1990.]

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COLUMBIA READIES FOR LAUNCH

Today Kennedy Space Center technicians will pressurize tanks inside Columbia containing toxic propellants which fuel the orbital maneuvering systems. During this loading operation, the pad will be closed to non-essential personnel. Other routine tasks will be undertaken after the hazardous fuel loading is completed. Over the weekend a faulty valve was repaired [see "Three Percent Work Thanksgiving] and the installation of explosive devices was completed. These are used to separate the Orbiter from its solid rocket boosters and its external tank. Countdown is targeted to begin at 12:01 a.m. November 29, leading to a 1:24 a.m. liftoff December 2. The official countdown and launch dates will be set following the Flight Readiness Review which begins today at KSC and concludes tomorrow. [Banke, **FLORIDA TODAY**, p. 5A, Nov. 26, 1990.]

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DELTA 2 LAUNCH SET FOR TODAY

McDonnell Douglas Space Systems Co. intends to launch its new, more powerful version of the Delta rocket this afternoon at approximately 4:32 p.m. from Launch Complex 17 at Cape Canaveral Air Force Station, said Air Force Spokesman Senior Airman **Michael Amato**. The launch window will remain open until 5:03 p.m. Air Force meteorologists predict a 90 percent chance of favorable weather for launch. The \$30 million Delta's payload is a \$65 million Global Positioning System satellite which will assist the U. S. Armed Forces worldwide and support Operation Desert Shield. Today's Delta 2 is a model 7925 which can lift 4,010 pounds into orbit. The model 6925 Delta 2 can lift 3,190 pounds into orbit and has been used until today. [Banke, **FLORIDA TODAY**, p. 5A, Nov. 26, 1990.]

November 26:

DELTA LAUNCH SUCCESSFUL

The Air Force's Delta 2 launch came at 4:39 p.m. "Everything appears to have gone very, very smoothly," said Air Force Lt. Col. Jim Jannette, after deployment of the military navigation satellite, part of the Global Positioning System of 21 projected satellites. The military satellite was the third to be launched here in the last two weeks and each, reportedly, has a role to play in Operation Desert Shield. [Halvorson and Banke, **FLORIDA TODAY**, p. 6A, Nov. 27, 1990, "Navigation Satellite On Mideast mission," **USA TODAY**, p. 3A, Nov. 27, 1990.]

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STS-35 PROCESSING

Columbia's payload bay doors will be open later this evening and final servicing of the Broad Band X-Ray Telescope payload is scheduled for November 28. The Flight Readiness Review begins tomorrow in the Operations and Checkout Building's Mission Briefing Room. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Nov. 26, 1990.]

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STS-39: PROCESSING OF DISCOVERY

Ammonia boiler freon loop decay checks were performed over the weekend on Discovery in the Orbiter Processing Facility. Bubble soap leak checks were conducted with several leaks identified near the cold plate manifold. Work will continue today to replace the cold plate manifold seals. X-Rays of the Orbiter body flap have been completed and routine work on the wheels and tires continues today. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Nov. 26, 1990.]

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ATLANTIS: POST-FLIGHT SAFING

Normal post-flight safing operations are continuing today on Atlantis in the Orbiter Processing Facility. Cryogenic drain operations were completed November 23 and the thruster plugs have been installed on the Shuttle. The payload bay door strong backs are being installed today and the doors are scheduled to be opened tomorrow. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Nov. 26, 1990.]

November 27: NASA SETS COLUMBIA LAUNCH TODAY

At the conclusion of today's Flight Readiness Review, NASA managers will announce a firm date for the STS-35 mission aboard Columbia. Astro-1 scientists, who manage the Astro-1 payload, have requested that NASA move the launch time from the expected 1:28 a.m. December 2 to about 4 a.m. which would increase the amount of scientific information generated during the mission by about 10 to 15 percent. "It would be nice," said Ed Weiler, Astro-1 Project Scientist, "but to be fair to the Shuttle world, the new time would introduce so many changes into their plans that it is probably not worth it." [Banke, FLORIDA TODAY, p. 6A, Nov. 27, 1990.]

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MORE ON HUBBLE TROUBLE

Lew Allen, chairman of a six-member Hubble Space Telescope investigation team, said that the blame for the installation of a faulty mirror in the HST must be shared "100 percent each" by both NASA and the manufacturer of the mirror. [See "Hubble Report Hits NASA, Maker" above, Nov. 26.] Allen, outgoing Director of NASA's Jet Propulsion Laboratory, said that the space agency failed because it lacked the expertise properly to oversee the grinding and polishing of the mirror. Rice University astronomer **Robert O'Dell** said that the Hubble's flaw resulted from people who oversaw the project not understanding the significance of certain test results. O'Dell was the Hubble project's chief scientist from the late 1970s until the mid-1980s. "What we didn't have," O'Dell said, "was a broad body of people who were experts in optics who could monitor what was happening at the contractor's plant, report on that and understand the significance of problems as they occur."

A retired Perkin-Elmer scientist said the Hubble problems had taught him one thing, "You can't be careful enough when you do this kind of work. When you do this kind of work you can't schedule it to the day and you can't price it to the penny. The same manufacturer, Perkin-Elmer, is making NASA's next big telescope, the Advanced X-Ray Astrophysics Facility. NASA says it will apply lessons learned in the Challenger disaster

and the more recent Hubble problems. [Groer and Schreuder, THE ORLANDO SENTINEL, pp. A-1 & A-4, Nov. 28, 1990, Banke, FLORIDA TODAY, p. 1A-2A, Nov. 28, 1990, "NASA Faults Itself, Hubble Lens Builder," USA TODAY, p. 3A, Nov. 28, 1990, "NASA Blamed in Hubble Flaw," THE NEW YORK TIMES, p. A10, Nov. 26, 1990.]



COLUMBIA LAUNCH DATE, OFFICIALLY

NASA managers today announced December 2 as the launch date for STS-35 which will involve Space Shuttle Columbia carrying the Astro-1 payload. The launch window extends from 1:28 a.m. EST to 3:58 EST. The launch date announcement followed completion of the Flight Readiness Review held today at Kennedy Space Center during which all Shuttle support elements stated they were ready to proceed with the launch of Columbia. "The Shuttle team has worked very hard to get Columbia ready to fly," said **Robert Crippen**, Space Shuttle Director. "With the hydrogen leak resolved, we're ready to end the year with the Astro-1 mission which will extend our knowledge of the universe."

The countdown will begin at 12:01 a.m. November 29. Air Force meteorologists say there is a 70 percent chance of favorable weather for launch December 2. A proposal that NASA delay the launch of Columbia till later in the morning to increase scientific research time was rejected on the grounds that the delay would have complicated last-minute planning. The astronaut crew is expected to arrive at KSC about 11:30 p.m. November 29. The crew, which is now in quarantine at Johnson Space Center to prevent them from getting sick before the mission, includes **Commander Vance Brand**, **Pilot Guy Gardner**, **Mission Specialists John "Mike" Lounge**, **Jeffrey Hoffman** and **Robert Parker** and **Payload Specialists Ronald Parise** and **Samuel Durrance**. Landing is planned for Edwards Air Force Base at 11:25 p.m., December 11, 1990. [Banke, FLORIDA TODAY, p. 4A, Nov. 28, 1990, **Campion and Malone**, "Launch Advisory: STS-35 Launch Date Announced," Nov. 27, 1990.]

November 28: COLUMBIA LAUNCH PREPARATIONS

Launch preparations are underway for Columbia's STS-35 mission. The countdown is scheduled to begin tomorrow morning at 1 a.m. with liftoff slated for 1:28 a.m. December 2. Today, the aft compartment will be closed out for flight. The power reactant storage and distribution system tanks have been purged in preparation for propellant loading operations scheduled November 30. [KSC SHUTTLE STATUS REPORT, Nov. 28, 1990.]

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DISCOVERY: SSME INSTALLATION

Today, the three main engines of Discovery are being installed in the Orbiter. Seals are being replaced in the freon cooling system. A screen test of the right orbital maneuvering system (OMS) pod is continuing this week at the Hypergolic Maintenance Facility. [KSC SHUTTLE STATUS REPORT, Nov. 28, 1990.]

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ATLANTIS: ORDNANCE SAFED

Post-flight pyrotechnic devices have been safed and preparations are underway to offload residual propellants from the orbital maneuvering system pods. Routine post-flight checks are being conducted on the three main engines. Post-flight inspections of the thermal protection system are about 85 percent complete. [KSC SHUTTLE STATUS REPORT, Nov. 28, 1990.]

November 29:

COLUMBIA COUNTDOWN STARTS

At 1 a.m. this morning the countdown for Columbia's long-delayed STS-35 mission began. "Columbia is looking real good," said the manager in charge of preparing the Orbiter for flight, **Bascom Murrah**. The crew is expected to arrive at 11:30 tonight. Countdown activities at Launch Complex 39B today include servicing the Broad Band X-Ray Telescope with argon gas, a task which must take place every ten days. Since the mission was first scrubbed in May, Kennedy Space Center workers have serviced the telescope 20 times. [Banke, **FLORIDA TODAY**, p. 6A, Nov. 29, 1990.]

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BRAND AND COMPANY ARRIVE

"We're back, we're ready, and we're wanting to get on with it," said Commander **Vance Brand** on his 11:29 arrival tonight at Kennedy Space Center accompanied by the six other members of his STS-35 crew. The crew includes Pilot **Guy Gardner**, Mission Specialists **Robert Parker**, **John "Mike" Lounge** and **Jeffrey Hoffman** and Payload Specialists **Ronald Parise** and **Samuel Durrance**. In the time before launch on December 2, the astronauts will practice emergency landings at the Shuttle Landing Facility and will attend briefings on the launch countdown status, the Orbiter and the payload.

NASA Test Director **Mike Leinbach** said, "The [launch] team's mood is real upbeat. Everyone's feeling real good and looking forward to a nice Christmas present, which will be getting that thing off the ground Sunday

morning." Though launch officials expressed confidence, they could not rule out the possibility of another delay. "It's the nature of the business," said Leinbach. "We want to get the thing off the ground, that's what we all strive for. If it doesn't go, it will be disappointing, of course, but we expect it will." [Halvorson and Banke, **FLORIDA TODAY**, p. 4A, Nov. 30, 1990.]

November 30:

COLUMBIA LAUNCH: GO

"Four years ago we were going to look at Comet Halley. In May we were going to look at Comet Bennett. In September we were going to look at Comet Levy. You've all heard that comets are harbingers of bad luck. Well, this time we have no comets, so we're going to go," said Mission Specialist **Jeffrey Hoffman** today prior to the launch of STS-35. Weather forecasters continue to predict a 65 percent favorable chance for launch of Columbia. The primary concerns are low clouds, high winds and cross winds which would be hazardous should Columbia have to execute a Return to Launch Site (RTLS) maneuver. [Brown, **FLORIDA TODAY**, pp. 1A-2A, Dec. 1, 1990, **KSC SHUTTLE STATUS REPORT**, Nov. 30, 1990.]

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STS-39 - DISCOVERY STATUS

Main engine 3, Number 2029, is scheduled to be installed in Discovery today. Seals are being replaced in the freon cooling system. A screen test of the right orbital maneuvering system (OMS) pod is continuing this week at the Hypergolic Maintenance Facility. [**KSC SHUTTLE STATUS REPORT**, Nov. 30, 1990.]

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STS-37 - ATLANTIS STATUS

Tires and brakes have been removed from the nose and main landing gears of the Space Shuttle Atlantis. Orbital maneuvering system a/c motor valves have been checked. Checks of the reaction control system a/c motor valves are planned today. Lubricating oil was drained from the auxiliary power units. Routine post-flight checks and inspections are continuing on the three main engines and the thermal protection system. Preparations are underway for draining residual hypergolic propellants from the orbital maneuvering system crossfeed lines and the manifolds this weekend. The OPF will be closed to all non-essential personnel during this operation. [**KSC SHUTTLE STATUS REPORT**, Nov. 30, 1990.]

DECEMBER

December 1: SHUTTLE REPLICA AT SPACEPORT

Visitors to the Spaceport USA on December 20 will have the opportunity to take a walk-through tour of a full-scale Space Shuttle replica. Named the "Ambassador," the 122-foot long model is the next best thing to climbing in a real Space Shuttle, according to visitor center officials. The full-scale replica, made of steel and fiberglass, will offer visitors an astronaut's view of the Space Shuttle's flight deck, crew quarters, and cargo bay.

A video display of Space Shuttle operations will be presented at the exhibit. Guests will have the opportunity to take photographs by the 56-foot-high Ambassador. The distinctive black and white coloring, which duplicates the tiles used on actual Space Shuttles, will make a striking background for those special family photos. After sundown, special lighting will illuminate the Ambassador and its dramatic 78-foot wing span. During the Christmas season, Spaceport USA will primarily be open from 9 a.m. until 6 p.m. daily, except on Christmas Day when the complex is closed. The Ambassador was built by an Apopka, FL, firm for Irvin and Kenneth Field Productions (Vienna, VA). The replica will be on display for four months through an agreement between its owners and TW Recreational Services Inc. [Phillips, KSC NEWS RELEASE NO. 199-90, Dec. 18, 1990.]

December 2: COLUMBIA LAUNCHED 1:49 A.M.

"We're proud to take Columbia back up again," said Commander Vance Brand from space following the 1:49 a.m. launch today. Range safety requirements delayed the launch from 1:28 a.m. The countdown was held until skies cleared enough so an Air Force helicopter could see the Orbiter's flight to an altitude of 8,000 feet intact. "It's like an early Christmas present," said Shuttle Launch Director Robert B. Sieck. "The team is absolutely ecstatic. They couldn't be happier. The leaks are behind us." He added that the successful launch of Columbia "goes a long way to erase the disappointments." Less than two hours later, at 3:13 a.m. EST, the Soviet Union launched a Soyuz TM-11 rocket with a Japanese journalist aboard as paid passenger.

Damage to Launch Pad 39B was reported to be minimal. The seven member crew entered the crew cabin at approximately 10:40 p.m. December 1. The other crew members include Pilot Guy Gardner, Mission

Specialists John "Mike" Lounge, Robert Parker, Jeffrey Hoffman and Payload Specialists Ronald Parise and Jeffrey Hoffman. The solid rocket boosters are scheduled to reach Hangar AF on the Cape Canaveral Air Force Station tomorrow morning. The Freedom Star is towing the left booster and the Liberty Star is towing the right booster. They will be disassembled at Hangar AF in preparation for refurbishment. Landing is scheduled for about 11:30 p.m. December 11 at Edwards Air Force Base, CA. [Halvorson, **FLORIDA TODAY**, p. 1A, Dec. 2, 1990, Broad, **THE NEW YORK TIMES**, p. 20, Dec. 2, 1990, Brown, **FLORIDA TODAY**, pp. 1A-2A, Dec. 3, 1990, **KSC SHUTTLE STATUS REPORT**, Dec. 3, 1990, Broad, **THE NEW YORK TIMES**, p. A6, Dec. 3, 1990, Hoversten, **USA TODAY**, p. 6A, Dec. 3, 1990, Sanger, **THE NEW YORK TIMES**, p. A6, Dec. 3, 1990, Date, **THE ORLANDO SENTINEL**, pp. A-1 & A-6, Dec. 3, 1990.]

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DISCOVERY IN OPF BAY 1

Both of Discovery's freon cooling loops passed leak tests this weekend and freon servicing is planned this week. The three main engines have been installed in the Orbiter in the Orbiter Processing Facility. Operations scheduled this week include tests of the Ku-band antenna, servicing of the water spray boilers, and a functional test of the waste containment system. Tests of the right orbital maneuvering system (OMS) pod to verify the internal screens in the propellant tanks have been successful at the Hypergolic Maintenance Facility (HMF). Tests will continue this week with the pod in a horizontal position. [**KSC SHUTTLE STATUS REPORT**, Dec. 3, 1990.]

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DUFFIN WINS SNOOPY

Eric Duffin, an electrical engineer employed by USBI at Kennedy Space Center, was presented today a Silver Snoopy Award by former astronaut Michael McCulley. Duffin received a pin, certificate and a letter which read in part: "Eric Duffin's consistent superior performance as an electrical engineer with USBI demonstrates the highest degree of professionalism. Through individual initiative and dedication, Duffin has been instrumental in contributing to personnel safety, improving operational efficiency and developing major changes in crucial automated test procedures as part of the booster program." ["USBI Employee Wins Silver Snoopy," **FLORIDA TODAY**, p. 9E, Dec. 2, 1990.]

December 3:

SPACEHAB WINS CONTRACT

NASA has awarded a \$185 million contract to Spacehab Inc., a company that plans to prepare Space Shuttle experiment modules at a facility being built at Port Canaveral. "It's good news for Spacehab, and we feel it's good news for Brevard County," said James Ball, Director of Marketing for the Washington, D.C.-based company. The contract requires the company to install NASA-sponsored space science experiments into Spacehab modules at the 37,000-square-foot Port Canaveral facility, which is expected to employ 50 to 60 people. ["Spacehab Wins Contract," **FLORIDA TODAY**, p. 4A, Dec. 4, 1990.]

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ATLANTIS IN OPF BAY 2

The Orbiter Processing Facility High Bay is closed to all non-essential personnel today while technicians continue to drain residual oxidizer and fuel from the orbital maneuvering system crossfeed lines and manifold. This operation was started October 2. The left OMS pod is scheduled to be removed December 7 and transferred to the HMF for post-flight operations. The three auxiliary power units have been deserviced of lubricating oil. [KSC SHUTTLE STATUS REPORT, Dec. 3, 1990.]

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RETRIEVAL SHIPS IN PORT CANAVERAL

The solid rocket booster retrieval ships arrived at Hangar AF on the Cape Canaveral Air Force Station at about noon today. The right booster parachute failed to separate from the booster at water impact. Officials are looking into why the pyrotechnic parachute separation devices failed. The boosters will be disassembled at Hangar AF in preparation for refurbishment. [KSC SHUTTLE STATUS REPORT, Dec. 4, 1990.]

December 4:

1991 SCHEDULE ANNOUNCEMENT

NASA plans a total of sixty Space Shuttle Flights over the next six years, according to plans to be announced this week. In 1991, NASA hopes to launch the following seven flights:

*Two unclassified Strategic Defense Initiative experiments in early March.

*The Gamma Ray Observatory in April.

*A Spacelab devoted to life sciences in May.

*A \$100 million Tracking and Data Relay Satellite in July.

*A missile-warning satellite for the Department of Defense in August.

*The Upper Atmosphere Research Satellite in October or November.

*A Spacelab International Microgravity Laboratory in November or December.

Endeavour is scheduled to make its first flight in May 1992 when Astronauts will rescue a communications satellite and practice Space Station assembly procedures. With Columbia's mission launched and Endeavour on the way to Kennedy Space Center next year, NASA plans 9 missions in 1992, 11 in 1993 and an average of 11 missions for 1994 through 1996. In 1991, Columbia will be decommissioned after its May 1991 Spacelab flight; the oldest Shuttle will then be sent back to Rockwell for major modifications and is expected to return to KSC in the spring of 1992. [Halvorson, FLORIDA TODAY, p. 1A, Dec. 5, 1990, "Hawaii Telescope's First Photo Released," USA TODAY, p. 3A, Dec. 5, 1990.]

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DISCOVERY'S STS-39 PREPARATIONS

Freon servicing is planned this week. Operations scheduled this week include tests of the Ku-Band Antenna, servicing of the water spray boilers, and a functional test of the waste management system. Tests of the right orbital maneuvering system (OMS) pod to verify the internal screens in the propellant tanks have been successful at the Hypergolic Maintenance Facility (HMF). Tests will continue this week with the pod in a horizontal position. Stacking operations are continuing in the Vehicle Assembly Building. The right aft center segment was mated shortly after midnight. The right forward center segment was transferred from the Rotation Processing and Surge Facility to the VAB and stacking of that segment is scheduled to begin today. [KSC SHUTTLE STATUS REPORT, Dec. 4, 1990.]

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STS-39 PROCESSING: ATLANTIS

Residual oxidizer and fuel propellants were drained from the orbital maneuvering system crossfeed lines and manifold and the bay was reopened for normal work early this morning. Tests of the radar altimeter and landing gear hydraulic struts are scheduled this week. Preparations are underway to remove the left OMS pod. Pod removal is scheduled Saturday, to be followed by transfer to the HMF for post-flight operations. The number 3 auxiliary power unit was disconnected in preparation for removal.

December 5: STS-35: COLUMBIA MISSION CONTINUES

At Hangar AF on the Cape Canaveral Air Force Station, work is continuing to disassemble the two solid rocket boosters. Today, the tunnel covers and linear shaped charges will be removed. The boosters will be disassembled at Hangar AF in preparation for refurbishment. Landing is planned for December 11 at about 11:25 p.m. EST on Rogers Dry Lake Bed at Edwards Air Force Base, CA. After about 5 of turnaround operations, the Orbiter will be ferried back to Florida. The 747 Shuttle Carrier Aircraft and Orbiter will be making several refueling stops across the country because of the extra weight due to Astro. [KSC SHUTTLE STATUS REPORT, Dec. 5, 1990.]



DISCOVERY: TACAN SYSTEM TESTS

Operations scheduled this week for Discovery in preparation for its STS-39 mission include freon servicing, tests of the Ku-Band Antenna, Tacan System tests, and tests of the main propulsion system pneumatic system. Tests are continuing at the Hypergolic Maintenance Facility (HMF) to verify the internal screens of the right orbital maneuvering system (OMS) with the pod in a horizontal position. A getaway special beam is being installed in the payload bay today. Preparations are underway to braze in gaseous helium check valves for engines 2 and 3 this week. [KSC SHUTTLE STATUS REPORT, Dec. 5, 1990.]



ATLANTIS PREPARATIONS IN OPF

Orbiter Processing Facility Bay 2 was cleared this morning of all non-essential personnel so technicians could disconnect the left orbital maneuvering system pod from Atlantis. The bay will be reopened tomorrow afternoon and transferred to the Hypergolic Maintenance Facility on December 8. Main engine drying operations are planned for December 6. Next week, heat shields will be removed in preparation for removal of the three main engines late next week. A test of the Orbiter's interior and exterior lighting system is currently underway. Meanwhile, stacking operations continue in the Vehicle Assembly Building. A minor debond between the inhibitor and case is being repaired on the right forward segment which will be lifted on the evening of December 8 for mating. [KSC SHUTTLE STATUS REPORT, Dec. 5, 1990, KSC SHUTTLE STATUS REPORT, Dec. 6, 1990.]

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MURPHY REPLACES PHILLIPS AT DE

Walter T. Murphy has been named Director of Engineering Development at Kennedy Space Center to replace the recently retired Jim Phillips. Murphy joined NASA at Cape Canaveral as a data systems specialist in June 1963. Two years later, he transferred to the Manned Spacecraft Center in Houston (now Johnson Space Center), where he served as a mathematician and electronics engineer. He rejoined the KSC team in 1973 as the lead software systems engineer on the launch processing systems task group for the Space Shuttle Program. Soon afterwards, he became chief of the Software Systems Branch in the Design Engineering Directorate and was a leader in launch processing systems software development.

For five years beginning in 1977, Murphy was chief of the Guidance, Digital and Software Division in the Shuttle Engineering Directorate, with responsibility for checkout of the initial Space Shuttle avionics system. From 1984 to 1986, he served as Associate Director of Shuttle Engineering, managing all Shuttle engineering activities at the Vandenberg Launch Site in California. Since 1986, he has served as Deputy Director of Engineering Development. [Buckingham, KSC NEWS RELEASE NO. 195-90, Dec. 5, 1990.]

December 6:

SRB DISASSEMBLY: STS-35

At Hangar AF today, thermal foam is being removed from the solid rocket boosters used by Columbia on its STS-35 launch December 2. The boosters' aft skirts will be removed tomorrow and the skirts will be prepared for shipping and refurbishment. [KSC SHUTTLE STATUS REPORT, Dec. 6, 1990, KSC SHUTTLE STATUS REPORT, Dec. 7, 1990.]

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DAN RICE CONSTRUCTION CONTRACT

Dan Rice Construction (Holly Hill, FL) has been awarded a \$329,927 contract to expand the Chemical Analysis Laboratory used to support the NASA Biomedical Operations and Research Office at Kennedy Space Center. The lab, which is operated by Bionetics Corp. for NASA, provides analyses of soil, water, hydroponic solution and plant tissue samples for the Controlled Ecological Life Support System (CELSS), space biology, and ecological programs. [Kristofferson, KSC RELEASE NO. 187-90, Dec. 6, 1990.]

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GOODSEN PAVING CONTRACT

Goodsen Paving (Sharpes, FL) has been awarded a \$1.2 million contract to widen Kennedy Parkway South at Kennedy Space Center from two to four lanes between the NASA Causeway overpass and Gate 2, the main southern entrance to KSC. This 2.3 mile, asphalt-topped stretch will tie in to the four-lane expansion of State Road 3 now underway by Brevard County. A rainwater runoff pond will also be constructed just north of Gate 2 to comply with St. Johns Water Management District regulations. Under these rules, such an area must be provided to allow the runoff from the new roadway to enter the local water table. [Kristofferson, KSC NEWS RELEASE NO. 186-90, Dec. 6, 1990.]

December 7:

POWER UP: DISCOVERY

Discovery is scheduled to be powered up later today in Orbiter Processing Facility Bay 1. Tacan activation and self-testing will continue through tonight. Forward yoke installation work continues, as does tile maintenance work. Hydraulic water spray boiler checkouts are scheduled over the weekend, as are checkouts of the main propulsion system (MPS) helium system and the Ku-Band Antenna. Leak and pressurization tests on various lines in the liquid hydrogen system are also scheduled. Several brazing operations were completed on the main propulsion system and installation of electronic boxes on cold plates continues. At the Hypergolic Maintenance Facility (HMF), screen tests of the right-hand orbital maneuvering system (OMS) continue. Final manifold draining is scheduled for next week. [KSC SHUTTLE STATUS REPORT, Dec. 7, 1990.]

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ATLANTIS TORQUE CHECKS COMPLETED

Testing of the main propulsion system continues. Low pressure pump torque checks were accomplished overnight. Waste management systems servicing has also been completed. The three main engines are scheduled to be removed December 12 and 13. Preparations are in work to move the left-hand OMS pod to the HMF tonight for required flight-interval maintenance. Auxiliary power unit (APU) lube oil servicing is also planned. Smoke detection and fire suppression system functional tests have begun and fire suppression equipment has checked out well. [KSC SHUTTLE STATUS REPORT, Dec. 7, 1990.]

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NASA KEEPS TAPES SECRET

The U. S. Circuit Court of Appeals for the District of Columbia today ruled that NASA is "entitled to an opportunity to prove its claim that release of the [Challenger cockpit] tape would invade the privacy of the deceased astronauts, of their families..." and sent the case back to U. S. District Judge Norma Holloway Johnson, who had ordered NASA to release the tape to **THE NEW YORK TIMES**. The space agency had invoked a privacy exemption under the Freedom of Information Act and said that releasing the tapes would subject the astronauts' families to emotional distress because the recordings would be played repeatedly on radio and television. Court of Appeals Judge D. H. Ginsburg wrote in his opinion returning the case that "disclosure of the file would reveal the sound and inflections of the crew's voices during the last seconds of their lives. Therefore, the tape contains personal information the release of which is subject to the balancing of the public gain against the private harm at which it is purchased." ["NASA Wins Round in Fight to Keep Challenger Tapes Secret," **FLORIDA TODAY**, p. 9A, Dec. 8, 1990, "NASA Wins A Round in Challenger Tapes Suit," **THE ORLANDO SENTINEL**, p. A-10, Dec. 8, 1990.]

December 8: **AMF DINNER AT SPACEPORT**

Rep. **Bill Nelson** (D-Melb., FL) and U. S. Senator **Jake Garn** (R-Utah) received the Quest Award from the Astronauts Memorial Foundation at their fourth annual awards dinner tonight at Spaceport USA. Five other awards were presented: **David Brown**, President of SKF Bearing Specialties received the Corporate Award; **Betty Castor**, Florida Education Commissioner received the Christa Award; **Bob McCall**, space artist, was awarded the Ambassador Award and the AMF's Community Service Award went to the University of Central Florida Institute for Simulation and Training. Senator Garn was the keynote speaker for the event and discussed both his 1985 flight aboard Discovery and his views on education. "We as a nation need to use foresight in looking at both the practical issues of space technology and the benefits gained when young minds embrace the ideas of the future," he said. ["AMF Honors Contributors," **FLORIDA TODAY**, p. 2B, Dec. 9, 1990.]

December 9: **NEW CENTAUR ON ITS WAY**

General Dynamics ships its first Centaur upper stage for the Titan 4 rocket to Cape Canaveral Air Force Station this month. The upper stage will first be used in mid-1991 aboard the Titan 4 to put a 10,000-pound military payload into geosynchronous orbit. Over the next five years, the U S Air Force will receive 15 of the upper stages from General Dynamics under a \$1.3 billion contract. The stage carries 50% more fuel than previous

versions. ["New Centaur Headed for Cape Canaveral," **FLORIDA TODAY**, p. 10E, Dec. 9, 1990.]

□ SPACEHAB TRAINING AT PORT CANAVERAL

NASA has awarded a new contract worth \$185 million to Spacehab, Inc., a company building experiment modules for Shuttle flights in the 1990s. The new contract will bring NASA astronauts to the port to train in 1991 or 1992 for a series of seven Space Shuttle missions. "Under the terms of the contract, Spacehab has responsibility for crew training. As a result, there will be a lot of crew training activities at the Florida facility," according to **James Ball**, Director of Marketing for Spacehab, a Washington, D. C., company.

The first Spacehab module is expected to be delivered to the company's Port Canaveral facility for prelaunch processing in September 1991. The Spacehab facility includes a specially designed "clean room," an environmentally controlled laboratory and customer work areas. [Halvorson, **FLORIDA TODAY**, p. 10E, Dec. 9, 1990.]

□ EARLY SHUTTLE LANDING?

Unless weather forecasts improve for California, NASA must decide whether Columbia will land at 12:54 a.m. tomorrow or a day later, according to Flight Director **Al Pennington**. The space agency recovered the option of a full ten-day mission when the crew successfully siphoned out waste water from a stopped-up storage tank. If the mission is cut short, Astro-1 will be repackaged for landing with 130 of its 250 targets observed, said Deputy Mission Manager **Eugene Urban**. If time permits, the Columbia crew may get a chance to speak with Soviet Foreign Minister **Eduard Shevardnadze** who is visiting the Johnson Space Center while in Houston for talks with Secretary of State **James Baker**. [Brown, **FLORIDA TODAY**, p. 1A, Dec. 10, 1990, Halvorson, **FLORIDA TODAY**, p. 4A, Dec. 11, 1990, Date, **THE ORLANDO SENTINEL**, pp. A-1 & A-5, Dec. 10, 1990.]

December 10: TUTOR TIME OPENS TODAY

Today at 10 a.m., Kennedy Space Center Director **Forrest S. McCartney** officially opens the new Kennedy Children's Center operated by Tutor Time International. The child care center is the result of an employee's suggestion and work by several organizations and employees through a specialized committee set up to plan a facility. The NASA/KSC Exchange Council reached an agreement with Tutor Time International, Inc. (Salt

Lake City, UT) for the design, construction, staffing, and operation of the facility. The one-story, 6,600-square-foot building is located just outside the security perimeter at the south end of the KSC Industrial Area, between Gate 2 and the NASA Causeway overpass. This placement allows non-badged spouses to also leave and pick up their children. Initially, up to 140 children of KSC employees will be cared for at the facility. [Phillips, KSC NEWS RELEASE NO. 196-90, Dec. 6, 1990.]

December 11: COLUMBIA ENDS MISSION EARLY

"Houston, wheels have stopped. We're home," Commander Vance Brand radioed to Johnson Space Center as Columbia came to a halt on the runway at Edwards Air Force Base this morning at 12:54 EST. Communication Liaison Mike Baker in Houston returned Brand's message with, "Beautiful landing; welcome home." Total mission duration was 8 days, 23 hours, 5 minutes and 8 seconds. Bad weather forced Columbia to land a day earlier; forecasts predicted rain both in California and Florida. Ground control temporarily lost radio contact with Columbia during its descent when a computer at a primary tracking center failed but there was no impact on the landing. The Orbiter's landing weight was 225,886 pounds - including the Astro-1 observatory; the only heavier mission was Columbia's return with the Long Duration Exposure Facility in January when its combined weight was 228,335 pounds.

The crew underwent routine post-flight physicals before leaving the Orbiter. The data gained from these checkups will be added to knowledge gained during longer missions as the program moves toward extended duration Orbiter missions. The crew members plan to return to Houston with their families later today.

KSC turnaround crews were on station at Dryden Flight Research Facility in preparation for the landing. By 6:55 a.m. today, the crews had Columbia in the mate-demate device. Sling, jacking and hoisting operations were underway by 10:25 a.m. An initial look at the Orbiter revealed about 85 "dings" of various sizes. After about six days of turnaround operations, the Orbiter will be ferried back to Florida. The 747 Shuttle Carrier Aircraft will need to make several refueling stops across the country because of the Shuttle's extra weight due to the Astro-1 observatory. [Brown, FLORIDA TODAY, p. 1A, Dec. 11, 1990, KSC SHUTTLE STATUS REPORT, Dec. 10, 1990, KSC SHUTTLE STATUS REPORT, Dec. 11, 1990, Marshall, USA TODAY, p. 1A, Dec. 11, 1990, Date, THE ORLANDO SENTINEL, pp. A-1 & A-6, Dec. 11, 1990.]

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AIM AT NEW GOALS: AUGUSTINE

"We are concerned that the Space Shuttle may be the thin reed that supports our entire civil space program," said Norman Augustine, Chairman of the panel established by Vice President Dan Quayle. Augustine's report says that NASA should develop an alternative to the Space Shuttle, focus on science instead of "glitzy megaprojects" and recommended redesign of Space Station Freedom. The report also warned that another Space Shuttle accident is likely. Vice President Quayle remarked, "This report clearly points out the need...for fundamental changes." He also called it a shot in the arm for NASA.

The report did not call for the abandonment of the Space Shuttle, saying: "The committee recognizes the important role of the Space Shuttle for missions where there is a need for human involvement." NASA Administrator Richard Truly said NASA would "look at every single recommendation and deal with it." [A tape recording of Truly's press conference remarks is held in the KSC Library Archives.] He said that, overall, he saw no major change in NASA's pace of science programs. [Hasson, **FLORIDA TODAY**, p. 1A, Dec. 11, 1990, Sharn and Flynn, **USA TODAY**, p. 3A, Dec. 11, 1990, Leary, **THE NEW YORK TIMES**, pp. 1A and B9, Dec. 11, 1990, Crawford, **THE ORLANDO SENTINEL**, pp. A-1 & A-6, Dec. 11, 1990.]

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COLUMBIA'S COMPUTERS INVESTIGATED

Two key computers which failed during the STS-35 Columbia mission which ended today will be investigated by NASA. The agency will also investigate Columbia's waste management system plumbing problems at Kennedy Space Center. Early speculation by NASA suggested that Shuttle processing teams may have failed to clean the computer panels prior to launch. "We think the lint [found inside the computers] probably came with the panels when they were given to us to install in the Orbiter," according to Bascom Murrah, Columbia's Processing Manager. [Lint, hair and even a piece of a peanut - items found in a filter after the flight - reduced air circulation and caused the machines to overheat.] Regarding the plumbing problem, Murrah said technicians replaced a waste water line and a plumbing valve prior to the flight but evidently didn't catch all debris in the system. [Brown, **FLORIDA TODAY**, p. 1A, Dec. 12, 1990, Banke, **FLORIDA TODAY**, p. 4A, Dec. 21, 1990.]

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GUARDS WORK WITHOUT CONTRACT

Until a new labor agreement is reached, Kennedy Space Center's security force will work without a contract. The Union Plant Guard Workers of America Local No. 128 represents between 200 and 250 KSC security guards who are employed by EG&G Florida Inc. [Halvorson, FLORIDA TODAY, p. 4A, Dec. 11, 1990.]

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DISCOVERY: POWER-UP TESTING

Powered-up testing of Discovery was briefly interrupted today when a power supply went down. However, backup power was brought on-line, and testing continued without further incident. Freon cooling loop #1 is undergoing vacuuming and drying. Workers are preparing for a main engine Flight Readiness Test (FRT) on December 14. [KSC SHUTTLE STATUS REPORT, Dec. 11, 1990.]

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ATLANTIS: MAIN ENGINE REMOVAL

Atlantis is scheduled to have its main engines removed starting December 12, with two engines scheduled to be pulled out on Wednesday and the third on Thursday. Powered-up testing continues. Tacan system testing also continues. Auxiliary power unit valve resistance checks are also underway. [KSC SHUTTLE STATUS REPORT, Dec. 11, 1990.]

December 12:

COLUMBIA RETURN: DECEMBER 17

Officials at Kennedy Space Center are optimistic that the Space Shuttle Columbia will return from California on December 17. "The bird looks in great shape and we're looking forward to getting it back here," said KSC Director Forrest S. McCartney. KSC spokesman George Diller said, "It still looks good for departure at first light on Sunday."

The fuel cell cryogenic reactants were offloaded tonight from the onboard storage spheres; the waste containment system [toilet] was also removed and awaits evaluation on return of the Orbiter to KSC. Scheduled for tomorrow is the removal of the payload Data Display Units; they will be flown back to KSC to begin troubleshooting the problem that developed with them inflight. Dumping of the Orbiter's flight data recorders continues. The installation of the protective cover over the star tracker was rescheduled for December 14 and rescheduled for December 15 is the removal of film from the Ultraviolet Imaging Telescope (UIT).

The weather at Dryden continues to have a generally favorable forecast for completing work on schedule and to depart Edwards Air Force Base December 16 for the two-day ferry flight aboard the Shuttle Carrier Aircraft. The cold front approaching southern California is not predicted to reach the area until December 15 bringing with it some increase in wind. [Banke, **FLORIDA TODAY**, p. 8A, Dec. 13, 1990, **COLUMBIA STATUS REPORT**, Dec. 13, 1990, **KSC SHUTTLE STATUS REPORT**, Dec. 12, 1990 and Dec. 13, 1990, Date, **THE ORLANDO SENTINEL**, p. A-7, Dec. 12, 1990.]

December 13: **EG&G'S NINTH YEAR WITH BOC**

Kennedy Space Center has awarded EG&G Florida, Inc. a one-year extension of its existing contract for base operations services valued at approximately \$182.8 million. The extension, effective January 1, 1991 through December 31, 1991, brings the cumulative value of the contract to \$1.26 billion. This is the eighth extension to the base operations contract competitively awarded to EG&G in January 1983. [Kristofferson, **KSC NEWS RELEASE NO. 197-90**, Dec. 13, 1990.]

□ **WEATHER COULD DELAY SHUTTLE RETURN**

A storm front approaching Edwards Air Force Base could delay the return of Columbia to Florida. If winds are greater than 15 miles per hour, some of the work needed to prepare the Orbiter for its ride aboard The Shuttle Carrier Aircraft would have to be delayed. Today Kennedy Space Center workers will drain remaining liquid hydrogen and liquid oxygen from the Orbiter's underbelly tanks. Bascom Murrah III, Shuttle Manager for NASA, said, "Everything is right on schedule and we haven't had any problems." [Banke, **FLORIDA TODAY**, p. 4A, Dec. 14, 1990, Banke, **FLORIDA TODAY**, p. 8A, Dec. 16, 1990.]

December 15: **KSC BOOSTS BREVARD ECONOMY**

In fiscal year 1990, Kennedy Space Center contributed \$1.32 billion to the Florida economy; that represented a \$132 million increase over the previous year. Contractors at the space center received about \$940 million and another \$224 million went to off-site businesses in the county. Florida businesses not located in Brevard County received about \$18 million and out-of-state purchases and contracts amounted to roughly \$61 million. Civil service salaries through the end of fiscal 1990 amounted to \$131 million, an increase of \$29 million over 1989. Of the 18,500 workers employed at KSC, 12,700 were employed by KSC contractors; 2,600 were civil servants and another 3,250 were employed in construction and tenant

jobs. ["KSC Economy Boost Goes Over \$1 billion," **FLORIDA TODAY**, p. 10E, Dec. 16, 1990.]

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MAY OPENING FOR ASTRONAUT MEMORIAL

The official opening of the Astronauts Memorial has been set for May 9, 1991, AMF officials announced. Appearing at the opening will be government dignitaries, NASA officials and former astronauts will be on hand for the memorial's unveiling. Surviving members of astronauts' families will also be on hand. The memorial honors **Theodore Freeman, Charles Bassett, Elliot See Jr., Clifton Williams Jr., Virgil "Gus" Grissom, Edward White, Roger Chaffee, Francis Scobee, Michael Smith, Ronald McNair, Ellison Onizuka, Judith Resnik, Gregory Jarvis** and **Christa McAuliffe**. ["Memorial to be Unveiled in May," **FLORIDA TODAY**, p. 10E, Dec. 16, 1990, Date, **THE ORLANDO SENTINEL**, Dec. 8, 1990.]

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KSC BLACKOUT

A relay in the uninterruptible power supply system at Kennedy Space Center apparently overheated and failed about 8:45 p.m. last night leaving the space center without power in the Launch Control Center for about 16 hours. The relay's failure caused a small fire in an electrical panel on the LCC's first floor; the fire was quickly extinguished by KSC firefighters, according to space center spokesman **Bruce Buckingham**. There were no injuries to personnel nor any damage to any ground-based processing equipment or flight hardware, according to Buckingham.

Processing work on Atlantis and Discovery in the Orbiter Processing Facility was halted during the blackout. Workers completed their troubleshooting efforts, replaced the failed relay and returned to routine operations by 1:48 p.m. today, according to **John Williams**, spokesman for Lockheed Space Operations Center. Shuttle managers foresee no delay in the upcoming launch of Discovery in March 1991. On April 2, there was another interruption in the power supply when plumbing broke and water was accidentally sprayed on electrical equipment. [Banke, **FLORIDA TODAY**, p. 1A, Dec. 16, 1990, "Shuttle Work is Set Back by Power Failure," **THE ORLANDO SENTINEL**, p. A-8, Dec. 17, 1990.]

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NASA/AUGUSTINE PANEL MEET

NASA Administrator **Richard H. Truly** and his senior managers from across the agency met today with Chairman **Norman B. Augustine** and a majority of the other members of the Advisory Committee on the Future

of the U. S. Program. The advisory committee issues its full report this week. "The meeting was candid and very constructive," said Truly following the 3-hour, closed-door session in Easton, MD. "We find the committee's report to be extremely supportive of NASA during the civil space program, and we clarified a number of points during our meeting that will help us move forward quickly." The report makes 15 specific recommendations and a number of suggestions for changes in the direction and scope of future U. S. initiatives in space.

Truly also announced he had named **Donald R. Puddy**, Director of the Flight Crew Operations Directorate at the Johnson Space Center (Houston, TX) to head a small team to assist him in determining how best to implement those recommendations in the report under the purview of NASA. "Many of the report's recommendations are consistent with initiatives already underway at NASA," Truly said. "Others can be put in place fairly soon, while some, by their very nature, will take longer. Many of the most important recommendations are interrelated and resource-dependent and will depend on the strong support of not only NASA, but also the White House and Congress."

The session with the advisory committee members took place at the end of a 2-day NASA Senior Management Meeting (which had been previously scheduled) comprising the top managers from NASA Headquarters and the Directors and Deputy Directors of all NASA centers. The first day of the meeting was devoted to an in-depth discussion among the agency's leaders. The advisory committee members who joined the meeting the next day including **Augustine, Edward C. (Pete) Aldridge, Jr., D. James Baker, Daniel J. Fink, Robert T. Herres, David T. Kearns** and **Louis J. Lanzerotti**. [Vincent, NASA NEWS RELEASE #90-161, Dec. 17, 1990.]

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ASTRO-1 FILM RETRIEVAL

The retrieval of exposed film from an Astro-1 Observatory Telescope will be attempted today by a dozen Kennedy Space Center workers who will crawl into Columbia's cargo bay. The retrieval has required special planning, training and the construction of special equipment, according to McDonnell Douglas Space Systems Co. Payload Operations worker **Ralph Moore**. "All the data is on that film," said **Ted Stecher**, Goddard Space Center's UIT Chief Scientist, "and we are very anxious to see it." The entire retrieval operation should take twelve hours. [Banke, FLORIDA TODAY, p. 5A, Dec. 15, 1990.]

December 17: COLUMBIA MAY HEAD HOME TODAY

Columbia may begin its trip home to Kennedy Space Center today as a result of NASA managers meeting. Forecasts for the flight path are looking somewhat better, but the ferry team was pessimistic about a 11:00 a.m. EST departure for Florida. The route includes a trip to Davis Monthan Air Force Base (Tucson, AZ) for fuel, then on to Kelly Air Force Base (San Antonio, TX) for an overnight stay. The next day, the Shuttle Carrier Aircraft and Columbia will head to Barksdale Air Force Base (Shreveport, LA) and from there to Kennedy Space Center's Shuttle Landing Facility.

Yesterday, workers at the space center tested components on Discovery's three Rocketdyne main engines to make sure they worked properly. They also removed one of Atlantis' two pods that house the orbital maneuvering engines and steering thrusters. The pod was moved to Discovery's hangar where it will be attached to the Orbiter later this week. [Banke, **FLORIDA TODAY**, p. 1A, Dec. 17, 1990.]

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SDI STARBIRD LAUNCHED

The Strategic Defense Initiative Organization launched a \$10 million Starbird rocket tonight at 10:37 p.m. from Launch Complex 20 at Cape Canaveral Air Force Station. That site was last used in the 1960s to launch Titan missiles. SDIO Program Manager Lt. Col. Lanny Larson said, "It looks like it was a 100 percent success. We know of nothing at all that went wrong." [Banke, **FLORIDA TODAY**, p. 1A, Dec. 18, 1990.]

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GAO: MAINTENANCE POOR AT KSC

"Many of NASA's facilities have not been adequately maintained and are in degraded conditions," according to a General Accounting Office report issued today. The GAO report said that NASA was working to correct the faults and suggested that the space agency develop a comprehensive maintenance strategy, spend more money on upkeep and conduct annual surveys to determine which of its centers most needs repairs. John E. O'Brien, Assistant Deputy Administrator of NASA, called the document "a useful assessment" and said that the space agency is correcting the problems. At KSC, the report cited:

*A leaky roof on the Vehicle Assembly Building which allowed rain to splash down on computers in the adjacent Launch Control Center.

*Ventilation systems and heating boilers so old that replacement parts are now unavailable.

*Obsolete circuit breakers at KSC and Ames Research Center which are so dangerous that power must be turned off to allow testing.

Congress has ordered NASA to spend \$20 million this year on long-delayed repairs; \$4.12 million of the money will be spent at KSC to: fix leaks in the LCC; modernize the sewage treatment plant; replace water pipes in the VAB; replace inaccurate electrical meters and faulty lights, and repair roads and parking areas. [Brown and **FLORIDA TODAY** wires, p. 1A, Dec. 18, 1990, "NASA Lets Repair On Facilities Slip, Report Confirms," **THE ORLANDO SENTINEL**, Dec. 18, 1990.]

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CAUSE OF FIRE DETERMINED

NASA officials have traced the cause of the small fire inside the Launch Control Center on December 14. A wire had been accidentally severed on December 12, according to **French Johnson**, Chief of the Electrical Mechanical Systems Branch. The system affected by the fire provided continuous power to critical computers that monitor the "health" of the Shuttle fleet. Lockheed Space Operations Co., the Shuttle Processing Contractor, will oversee a \$1.2 million refurbishment which is expected to be completed by January 12. [Banke, **FLORIDA TODAY**, p. 2A, Dec. 18, 1990.]

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COLUMBIA RETURN DELAYED

Due to weather conditions, the departure of Columbia atop its Shuttle Carrier Aircraft, has been rescheduled for December 18. Today's forecast showed a low freezing line located at 8,000 feet, air turbulence, and a significant crosswind at Biggs Army Airfield (El Paso, TX). Conditions are expected to be favorable as far as central Texas tomorrow. [Diller, **COLUMBIA STATUS REPORT**, Dec. 17, 1990.]

December 18: NASA CREATES NEW MANAGEMENT JOBS

Administrator **Richard H. Truly** said today that NASA will "move out aggressively across the board" on all the Augustine Report recommendations and will create two new management jobs to oversee exploration and to recruit technical talent for the space agency. Truly also discussed the possibility of separating the Space Shuttle Program from other development programs in a NASA-wide television address. "Assuming we do eventually go that way, the transition must be very long

and carefully laid out because it would mean the moving of literally billions of dollars of our programs," he said. "And there is also the need to make sure that 'safety first' is maintained within the Shuttle Program."

The new Office of Exploration will be positioned under an associate administrator; its first duty would be to lay out "well thought-out" options to meet the challenges or returning to the moon and exploring Mars. The new Office of Human Resources will insure that NASA has the engineering, scientific and administrative talent necessary to fulfill its missions. These include the high priority space program, the 75-year-old aeronautical research program, Mission to Planet Earth to help protect the environment and the planetary exploration program - the Mission from Planet Earth.

Truly pledged that NASA would seek ways to implement the committee report. He said that the agency would place considerable emphasis on beginning the committee's recommendations to develop a heavy lift launch vehicle and to insure the vigor of the nation's entire civil space transportation system. The heavy lift vehicle was proposed to insure access to space. The backbone of the U.S. access to space is the Space Shuttle, which will celebrate its 10th anniversary of flight next April. The advisory committee said that the United States will be "unalterably committed to the Space Shuttle for many years". Therefore, NASA "must take steps needed to enhance the Shuttle's reliability, minimize wear and tear, and enhance launch schedule predictability."

The panel declared that "the Space Shuttle is essential to America's civil space program for the next decade or more. Truly also noted his appointment of Donald Puddy to head a small team to help the Administrator determine how to implement the Augustine Panel's recommendations. Currently Puddy is Director of the Flight Crew Operations Directorate at the Johnson Space Center (Houston, TX). [Vincent, NASA PRESS RELEASE NO. 90-162, Dec. 18, 1990, Brown, FLORIDA TODAY, p. 4A, Dec. 19, 1990.]

II COLUMBIA DEPARTS DRYDEN RESEARCH FACILITY

Perched atop its Shuttle Carrier Aircraft, Columbia departed Dryden Research Facility in California this morning at 10:03 EST en route to its first refueling stop at Biggs Army Air Field (El Paso, TX). At Biggs, NASA managers will conduct a cross-country weather assessment to ascertain whether the mated vehicles may safely continue to the preferred overnight stop at Barksdale Air Force Base (Shreveport, LA), or if safety requires

landing at Kelly Air Force Base (San Antonio, TX). Arrival at Kennedy Space Center is expected for early afternoon December 19.

Once back at KSC, about four days of deservicing is required to safe the vehicle before ground crews can take time off for the holidays. After demate from the SCA, Columbia will be transported to the Vehicle Assembly Building where it will remain for about a month, until Discovery is moved from the Orbiter Processing Facility to the VAB. [Brown, FLORIDA TODAY, p. 4A, Dec. 19, 1990, KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Dec. 18, 1990.]

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DISCOVERY: PAYLOAD TEST

The STS-39 payload integration verification test continues in the Orbiter Processing Facility. The right-hand orbital maneuvering system pod was lifted from Discovery last night and installation procedures are continuing today. The forward reaction control system will be positioned and installed December 20. Mass spectrometer leak checks of the main propulsion system have been completed. Nose cap installation is complete, pending final duct installation. In the Vehicle Assembly Building, the STS-39 external tank is being lifted to the twin solid rocket boosters and mating will begin this afternoon. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Dec. 18, 1990.]

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ATLANTIS: PAYLOAD BAY DECONFIGURATION

Payload bay deconfiguration of Atlantis is scheduled to be completed today. Auxiliary power unit relief valve work is in progress. APU water valve replacement occurred December 17 as part of normal unit maintenance. Modifications to install carbon brakes on the Orbiter continued today and should be completed tomorrow. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Dec. 18, 1990.]

December 19:

COLUMBIA STILL HEADING HOME

Stormy weather across the country has held up the return of Columbia to its home at Kennedy Space Center. It is expected to arrive at approximately 10:15 a.m. tomorrow. If weather does not prevent the journey, Columbia and its Shuttle Carrier Aircraft should depart Barksdale Air Force Base (Shreveport, LA) at 8 a.m. tomorrow. The final route to the space center will be determined by the pilot and is dependent on weather and wind direction; if conditions permit, the mated vehicles will pass low over Brevard beaches between Patrick Air Force Base and Port Canaveral. [Banke, FLORIDA TODAY, p. 13A, Dec. 20, 1990.]

December 20:

HOME AT LAST!

Columbia, atop its Shuttle Carrier Aircraft, finally ended its cross-country ferry flight when it landed at the Shuttle Landing Facility here at Kennedy Space Center this afternoon at 1:01 p.m., about three hours behind schedule. The departure of the mated vehicles from Barksdale Air Force Base (Shreveport, LA) was postponed until weather over the Florida Panhandle cleared. NASA Pilot **Ace Beall** flew over Titusville, FL, then turned south over Merritt Island, FL, and headed back northward to KSC, landing just after a brief rainshower moistened the runway. The vehicle was demated tonight and protective window covers were installed. [Banke, **FLORIDA TODAY**, p. 4A, Dec. 21, 1990, **KSC SPACE SHUTTLE PROCESSING STATUS REPORT**, Dec. 21, 1990.]

December 21:

MERGE SHUTTLE CONTROL AT KSC

Among other recommendations made by the recent Augustine Report is the suggestion that NASA should plan to consolidate Shuttle Program responsibility at Kennedy Space Center. Center Director **Forrest S. McCartney** said, "As the program transitions from a development program to a recurring operation, the center of activity naturally gravitates toward KSC. It's too early to say what will happen. I certainly don't see any diminished role for KSC. I see it possibly enhancing." He went on to say that astronaut training and mission control would probably not move from Johnson Space Center (Houston, TX), but that managers located at NASA Headquarters and a Marshall Space Flight Center (Huntsville, AL) could be moved to KSC; MSFC employs about 1,000 people in the Shuttle Program. [Brown, **FLORIDA TODAY**, p. 1A, Dec. 22, 1990.]

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STS-39 PROCESSING: DISCOVERY

The payload bay doors on Discovery were closed early this morning; hydraulic operations to reconfigure the aerosurfaces and landing gear have also been completed. Electrical checks of the right hand orbital maneuvering system will continue today as will installation operations of the forward reaction control system on the nose of the vehicle. Power down of the vehicle for the holidays is scheduled for the end of the first shift today. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Dec. 21, 1990.]

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ATLANTIS: BRAKE INSTALLATION WORK

Work to install the new carbon brakes on the Orbiter's wheels will continue today. Brakes on the right hand wheel were completed

yesterday. Work on the left hand wheel will pick up this morning. The payload bay doors were closed on time yesterday and modifications to upgrade the general purpose computers will continue today and through the end of the first shift. Processing operations will resume after the first of the year. [KSC SPACE SHUTTLE PROCESSING STATUS REPORT, Dec. 21, 1990.]

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COLUMBIA HOUSED IN VAB

Kennedy Space Center officials said today that the Space Shuttle Columbia will stay in the Vehicle Assembly Building until late January, 1991. Columbia's protective tail cone will be removed inside the VAB, according to KSC spokesman **Bruce Buckingham**. While in the VAB, workers can't open up the Shuttle's cargo bay doors so the Astro-1 payload will remain inside the vehicle, but work will proceed on the Orbiter's thermal protection system and some tasks in the rear engine compartment, said **Bascom Murrah**, Columbia Processing Manager. [Banke, **FLORIDA TODAY**, p. 9A, Dec. 22, 1990.]

December 22: KENNEDY PARKWAY PAVING CONTRACT

Goodsen Paving (Sharpes, FL) has been awarded a \$1.2 million contract to widen Kennedy Parkway South from two to four lanes. The local paving company will have 250 days to complete widening of the two-way portion of Kennedy Parkway South between the NASA Causeway and Gate 2, the main south entrance to the space center. The 2.3 mile, asphalt-topped stretch will tie in to the four-lane expansion of State Road 3 now being carried out by Brevard County. ["Sharpes Firm Wins Contract," **FLORIDA TODAY**, p. 10E, Dec. 23, 1990.]

December 27: KSC SPACE STATION PLANT

NASA is revising its budget plans for the \$37 billion Space Station and that has put construction of Kennedy Space Center's Space Station processing plant on hold. Bids were solicited for the construction in August, but Congress cut the Space Station budget by \$600 million and ordered NASA to look at restructuring the program. Associate Administrator for Space Flight **William Lenoir** said, "If we cannot come up with what we consider a reasonable program then...we ought to hang it up. We have \$6 billion more program planned than we have money for." KSC's Director of Procurement **Wes Dean** said, "Our position is that the processing plant is needed regardless of the final size or configuration of the space station." [Brown and Banke, **FLORIDA TODAY**, p. 1A, Dec. 28, 1990.]

December 31:

TOURISM UP AT KSC

"When citizens of countries that don't have a space program visit Florida, they want to see the American space program first-hand. At the same time, Americans continue to show great interest and pride in the space program," said Tom Blair, Marketing Supervisor at KSC's Spaceport USA. More than 3.1 million people toured the space center in 1990, an increase of 5.2 percent; December's increase over 1989 was 5.1 percent. Spaceport USA is operated by TW Recreational Services for NASA; company officials cite a number of events at Florida's fourth largest tourist attraction accounted for the 1990 visitorship: the arrival of Ambassador, a Space Shuttle replica; groundbreaking for the \$6 million Astronauts Memorial and construction of the 80-seat Satellite Sky Theater. [Banke and Willmore, **FLORIDA TODAY**, pp. 1A-2A, Dec. 29, 1990, Boylan, **FLORIDA TODAY**, p. 1A, Jan. 5, 1991, "1990 Highlights of Kennedy Space Center Spaceport USA's 6th Record Breaking Year," **SPACEPORT USA PRESS RELEASE NO. NT0581**, Jan. 3, 1991, Bumpus-Hooper, **THE ORLANDO SENTINEL**, pp. A-1 & A-2, Dec. 9, 1990.]

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